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REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1955.

General

One of the outstanding features of the past year in the Gardens was the news that, following experiments carried out by the Ministry of Works, it would be possible to repair the Palm House instead of replacing it. The northern portion which has already been reconstructed not only emphasises the fine proportions and beauty of Decimus Burton's original design but, through the complete reglazing with glass of the former dimensions, has restored the good illumination essential to the well being of tropical species. Although the Coronation Arches will not now be utilised, as was proposed when a new structure was contemplated, the association of the Royal Botanic Gardens with the Crown and an historic occasion will nevertheless be achieved since the " Queen's Beasts " in stone are to adorn the foot of the Palm House Terrace.

The problem of future accommodation continues to cause grave concern, and plans for a new Library which will release space now occupied by books in the Herbarium are under consideration. The problems of space in the Gardens, especially the provision for successional planting of trees, are no less acute, but as yet it has not been found possible to implement the proposals put forward by the Director to solve them.

It was a great pleasure that Mr. Heathcote Amery, so soon after his appointment as Minister of Agriculture, was able to visit the Gardens officially and to welcome him again on an unofficial visit subsequently.

The Director retired from the position of Biological Secretary of the Royal Society on November 30th, having served in that capacity for the Statutory limit of ten years. Both the retiring President, Lord Adrian, and the new President, Sir Cyril Hinshelwood, paid tribute to his services.

The Science Masters' Association elected the Director as their President for 1955 and he delivered the Presidential Address on December 28th, taking as his subject, " Science and Education ". Members of the Association visited Kew on December 30th, under the guidance of their President and Dr. Turrill.

It is a pleasure to record that Her Majesty the Queen conferred the O.B.E. upon Dr. Turrill in the Birthday Honours list and that Mr. Hubbard has been accorded special promotion to the rank of S.P.S.O. We welcome the appointment of Mr. Russell as Economic Botanist in succession to Sir Geoffrey Evans.

The Hon. Fellowship of Wye College was conferred upon the Director on June 28th, when Professor Miles paid a charming tribute to his services to Agricultural and Horticultural Science.

It is with great regret that we have to record the death of Miss Bruce whose services we recall with gratitude and of whom an obituary notice appears in this issue.

Miss Jane Taylor, who was in charge of the Bryophyta, resigned her post towards the end of the year.

The Herbarium

Some aspects of the normal activities are indicated by the following figures :—

Specimens received for the Herbarium, excluding those prepared at Kew from living material, 63,530 ; sheets received on loan, 9,938 ; sheets sent on loan, 3,844 ; sheets distributed as duplicates, 25,511 ; sheets mounted, excluding *Algae*, *Lichenes*, *Fungi*, and *Bryophyta*, and specimens received already mounted, 57,243. The use of plastic mountant continued to give good results.

Visits by botanists numbered 3,985. Many of the visitors were from overseas and all continents and many countries were represented.

During the year a total of 2,660 enquiries and plant consignments have been dealt with by the Herbarium and Library staff alone. Many of these enquiries involved considerable research into taxonomic and other botanical problems, nomenclature, or literature.

As in previous years, a number of evening lectures, illustrated by slides or films, were given by visiting or Kew botanists. They were much appreciated by members of the staff and their friends.

Mr. W. C. Worsdell continued to give valuable help to members of the scientific staff by translations of botanical papers from various languages. Miss M. M. Whiting has given continuous voluntary assistance in the Tropical Asian department.

The Keeper, Dr. W. B. Turrill, served on various scientific committees. Mr. C. E. Hubbard continued to serve on the " Advisory Committee on Research designed to improve Sea Defences."

Exhibits by members of the staff were set up and demonstrated at the rooms of the Linnean Society on 1 December at the President's reception.

Students' Day was held on 7 May. A number of exhibits were arranged in the Herbarium and Library and parties were conducted round the Gardens, Museums, and Jodrell Laboratory. 206 students attended.

A special exhibition under the general title " Art in the service of botany " was arranged in the Herbarium and Library for members of the National Art-Collections Fund on 10–11 June. This was seen and

much appreciated by 332 visitors. The ground floors of the three wings of the Herbarium and the first floor of the Library were filled with carefully selected and arranged exhibits.

Wing A. Original artistic work of Kew botanists, including examples by Sir W. J. Hooker, Sir J. D. Hooker, and Professor D. Oliver.

The contributions of the Bentham-Moxon Trustees to the Kew collections : gifts of rare books of artistic merit, paintings and drawings for the Icones Plantarum.

Original paintings by Botanical Magazine artists to illustrate the continuous history of the oldest botanical periodical.

Examples of Roxburgh's paintings of Indian plants.

Drawings of British plants.

An exhibit to illustrate photography in the service of botany. Studies of individual plants and of vegetation and examples from the Kew collection of photographs of botanists.

Art form in dried specimens.

Art form in fruits and seeds.

Grasses as art objects.

Orchids as subjects in paintings.

Wing B. The whole of the ground floor of this wing was devoted to an exhibition to illustrate the general history of botanical art. On a series of screens were to be seen paintings and drawings by many famous botanical artists. The arrangement was approximately chronological and the examples were carefully selected from the extensive Kew collections to illustrate styles, variety of treatment, and range of subject matter. On the large central tables were shown supplementary exhibits which could not, because of their nature, be incorporated in the main sequence.

Wing C. On the ground floor of this Wing were exhibited drawings and paintings of the so-called lower plants, that is of plants reproducing by spores and not by flowers and seeds. Many of these plants have particular beauties of their own as was to be seen from the examples illustrative of *Algae*, especially seaweeds, *Fungi*, Mosses, Liverworts, Ferns, and Fern-allies.

In the *Front Library* and *Catalogue Room* there were exhibited, amongst other items, original paintings by Ehret, first editions of classical botanical books, and a series of herbals and other books to illustrate botanical art of various periods.

A generous gift to the Herbarium of about 10,000 specimens of extra-African plants from the National Herbarium, Pretoria, has proved most valuable, especially on account of the plants from the Mediterranean Region and the Americas. Several collections not previously represented at Kew were included and these are being sorted and incorporated as soon as possible.

At the Royal Horticultural Society's show on 20 October 1955 there were two outstanding exhibits of fruiting specimens of trees and shrubs, one from the Commissioners of Crown Lands, Windsor, the other from Capt. N. McEacharn, Villa Taranto, Pallanza, N. Italy—the latter including many fruits rarely produced in cultivation in this country.

By the courtesy of the exhibitors and the Society, much of the material was brought to Kew where it has been preserved partly for the Kew collection and partly for distribution to other herbaria.

Europe, Orient and N. Africa. The number of enquiries received relating to the British flora continues to increase, augmented by problems arising from the scheme, sponsored by the Botanical Society of the British Isles, to prepare detailed distribution-maps of British plants. Such routine work claims a great deal of the department's time, especially during the spring and summer months.

Mr. R. D. Meikle has completed a draft account of *Malvaceae* for the Flora of Cyprus ; this draft has been circulated amongst collectors and other helpers for advice and comment. An account of the Cyprian *Ranunculaceae* is now almost finished.

Mr. R. A. Blakelock continues his studies of the flora of 'Iraq and, during the past year, has been dealing with valuable collections sent by Mr. E. R. Guest, Dr. A. Rawi, Dr. R. Wheeler Haines and Dr. Hans Helbaek. An account of *Cruciferae* to *Frankeniaceae* is now in press. Mr. Blakelock's specialist knowledge of *Celastraceae* has been utilized by the editors of the Floras of West Tropical Africa and Tropical East Africa in preparing accounts of the family for these two works.

The National *Dianthus* Collection has flourished during the hot, sunny summer of the past year ; more than 250 sowings have been made, chiefly of seeds obtained from European botanic gardens. Valuable material (living plants or seeds) has been received from Innsbruck Botanic Gardens ; from Dr. P. H. Davis (Kurdistan) ; Major Malloy (Turkey), and Dr. R. W. G. Dennis (Portugal), but more seed from localized " wild " plants is urgently required. Miss S. S. Hooper, officer in charge of the Collection, is planning to supply botanic gardens with selfed seed from correctly named stocks, partly to reduce the confusion at present existing in cultivated collections of the genus, and partly in the hope that seed from " wild " plants may be received in exchange for this authenticated material. Mr. R. C. Carolin left Kew on the termination of his D.S.I.R. scholarship, and has since been appointed to a lectureship in Sydney University. He has completed a revision of *Dianthus* sect. *carthusiani* which should shortly be ready for publication.

In addition to the collections already mentioned, the department has received valuable material from the following collectors : Dr. P. H. Davis (Turkish Kurdistan), Dr. C. N. Goulimy (Greece), Hunting Aerosurveys (Jordan, 'Iraq), Mr. J. E. Lousley (Britain), Mr. F. Merton (Cyprus), Lady Proby (Teneriffe), Dr. K. H. Rechinger (Persia), Mr. N. Y. Sandwith (Spanish Pyrenees), Dr. H. Scott (Grand Canary), Mr. A. C. Trott (Lebanon), Mr. R. Codrai (Arabia), and Dr. H. E. Schwan (Arabia).

The department was glad to welcome Mrs. Vivi Täckholm (Cairo University), who spent three summer months at Kew, working on the Flora of Egypt. Mrs. Täckholm was accompanied, for part of her visit, by Miss Amal Amin, whose researches on *Launaea* are likely to be of the greatest interest and value. Dr. H. Kayacik (Turkey) was another welcome visitor ; his essay on the distribution of *Picea orientalis*

(L.) Carr. has already appeared in the Kew Bulletin (no. 3, 1955). Dr. Sara Leinkrom (Israel) spent several weeks revising the Mediterranean and Oriental *Papaver* species ; Mr. P. F. Yeo (Cambridge Botanic Garden) has given valuable help with *Euphrasia*, and has paid several visits for the purpose of identifying horticultural plants. Dr. P. H. Davis continues to be a regular and welcome visitor, ever ready to help with taxonomic problems relating to Turkey and the eastern Mediterranean.

Thanks are due to Dr. S. M. Walters and Mr. P. D. Sell (Cambridge) for their willingness to examine and identify *Alchemilla*, *Montia* and *Hieracium* specimens forwarded to Kew ; Mr. J. P. M. Brenan and Mr. N. Y. Sandwith have been constantly helpful in assisting with the determination of critical British plants and aliens.

Northern Asia, China, Japan, Northern India. A considerable amount of time has been absorbed, as usual, by the identification of cultivated plants, and by other enquiries (including several from India, Pakistan and Burma), and requests for loans.

The selection of specimens for Kew from the collections received from Hongkong, and the distribution of duplicates, has continued. A start has been made on mounting and laying into the herbarium a collection made by Dr. Bor in Lahaul. A small collection of plants, made by Mr. C. R. Stoner on the Daily Mail Expedition to Nepal, has been named and incorporated.

Numerous enquiries concerning the genus *Camellia* have been answered, and an account of the genus has been prepared for the Supplement to the R.H.S. Dictionary of Gardening. A collection of specimens of *C. rusticana* from Japan was kindly made available for study by Mr. L. Charette, and an article on this interesting plant has been prepared for the R.H.S. Rhododendron and Camellia Year Book.

Work was resumed on a revision of the genus *Sarcococca*, and it is hoped that this will be completed in 1956.

The listing of the Roxburgh drawings, mentioned in the report for 1954, has been completed and the final checking of the plates is now nearly finished. It should soon be possible to prepare the MS. for publication.

Tropical Asia. The main contribution of specimens to this department during the year came from the Herbarium Bogoriense, which presented 2,569 Indonesian specimens. Other collections received include over 1,000 New Guinea plants collected by Dr. R. D. Hoogland and presented by the Division of Plant Industry, C.S.I.R.O., Canberra. Specimens were also received from the Philippine National Herbarium and the Forestry Department, N. Borneo, making a total of over 4,000 specimens.

Over 6,000 duplicates were prepared from specimens collected by the Forestry Department, N. Borneo and were distributed to 8 herbaria.

A large collection of photographic negatives of Malayan plants was kindly lent to Kew by Mr. M. R. Henderson, formerly Director of the Botanic Gardens, Singapore. Prints have been made of many of these and they have been incorporated in the collection of illustrations.

Mr. L. L. Forman completed his revision of the Malaysian species of *Stephania* and left at the end of December for Indonesia, where he is spending one year at the Herbarium Bogoriense.

Visitors during the year included the following botanists from Leiden who were revising groups for Flora Malesiana : Mr. A. C. van Bruggen (*Payena*), Mr. P. W. Leenhouts (*Canarium*) and Dr. H. Sleumer (*Proteaceae*). Mr. J. A. R. Anderson from the Forest Department, Sarawak worked on recent collections made by his department. Mr. J. Wyatt-Smith from the Forest Research Institute, Kepong worked on *Dipterocarpaceae*.

Tropical Africa. The section has suffered a grievous loss through the death in the autumn of 1955 of Miss E. A. Bruce, after a painful illness bravely borne. We shall long miss the benefit of her kindliness and wide botanical experience.

In the spring Mr. R. B. Drummond left us to take up a botanical post in Southern Rhodesia, leaving in the Kew Herbarium many marks of his industry, care and sound taxonomic judgement. He was succeeded by Mr. R. A. Graham.

The head of the Tropical African Section, Mr. E. Milne-Redhead, accompanied by Mr. P. Taylor, left England in the autumn on a collecting expedition, which is due to last until well on in 1956, to the southern part of Tanganyika Territory. The results of this expedition, to an area botanically so rich and so imperfectly known, should be of immense value for the continuation of the " Flora of Tropical East Africa ".

Work continues actively on the " Flora of Tropical East Africa ". Mr. J. B. Gillett has completed his revision of the large and difficult genus *Indigofera*, while Mr. J. P. M. Brenan is in process of revising the East African acacias. Mr. Milne-Redhead's revision of *Crotalaria* is necessarily in abeyance during his absence in Africa. Miss E. A. Bruce, at the time of her death, had not finished her account of the *Loganiaceae* ; in particular, her researches on *Strychnos* were far from complete. The difficult task of finishing this family for the " Flora of Tropical East Africa" has been entrusted to Mr. J. Lewis, who also during the year has finished the *Rhizophoraceae*. Mr. J. H. Hemsley, whose research into *Sapotaceae* continues, has also completed the *Caricaceae* during the year, and is starting work on the *Cucurbitaceae*. Miss J. Elffers has completed the *Resedaceae* and is undertaking the *Capparidaceae*. Mr. R. A. Graham has finished an account of the *Orobanchaceae*, and is now working on the *Polygonaceae*.

Mrs. O. Milne-Redhead, Miss E. M. Stones and Miss A. V. Webster have contributed the illustrations which are so important a part of the Flora.

Collections from many parts of tropical Africa continue to enhance the riches of the Kew Herbarium with carefully dried and well annotated specimens which bear witness to the good work of their collectors. Important collections have been received from :—

F. C. Deighton, H. D. Jordan, D. Small (Sierra Leone) ; Mrs. W. J. Harley (Liberia) ; R. Rose-Innes, Prof. A. S. Boughey and other collectors through the University College of the Gold Coast, Achimota

(Gold Coast) ; Miss A. McClintock, Prof. P. W. Richards, C. F. A. Onochie and other collectors through the Forest Herbarium, Ibadan (Nigeria and the British Cameroons) ; J. T. Davey (French Sudan) ; Dr. P. E. Ellis (Ethiopia) ; W. J. Eggeling, H. A. Osmaston (Uganda) ; P. R. O. Bally, Dr. P. J. Greenway, Mrs. D. L. Irwin, Mrs. D. R. Tweedie, B. Verdcourt and other collectors through the East African Herbarium, Nairobi (Kenya) ; Dr. W. J. Eggeling, Mrs. H. G. Faulkner, J. Hughes, R. E. S. Tanner (Tanganyika) ; A. de F. Gomes e Sousa (Portuguese East Africa) ; G. Jackson (Nyasaland) ; Dr. H. Wild and various collectors through the Government Herbarium, Salisbury (Southern Rhodesia) ; E. B. Best, D. B. Fanshawe, A. E. King (Northern Rhodesia). Dr. G. W. Reynolds has continued to enrich our *Aloë* collection by specimens and photographs.

The preceding list is only a selection of the collections received, but our gratitude is due to all, mentioned or unmentioned, who have so kindly helped our work in this way. We have continued to receive valuable help and co-operation from other Institutes, such as the Jardin Botanique de l'État at Brussels and the Botanischer Museum und Garten, Berlin-Dahlem. Some duplicates of the material collected by Dr. G. Troupin in the Parc National de la Garamba, Belgian Congo, deserve special mention among those presented. Further important material has been received from the Imperial Forestry Institute, Oxford, particularly duplicates of the plants collected in Northern Rhodesia by Messrs. F. White and A. Angus. A valuable set of the West African collections made by Dr. G. Roberty has come to us through the Conservatoire et Jardin Botaniques at Geneva.

During 1955, 22,599 Tropical African specimens were laid out and mounted, and approximately 20,000 were laid into the Herbarium.

The second part of the first volume of the Flora of West Tropical Africa, which is being revised by Mr. R. W. J. Keay, assisted by Mr. F. H. Hepper, was completed during the year, and it is expected it will be published in 1956. As before, acknowledgement is due to the fine illustrations for this work that have been prepared by Miss E. M. Stones.

It is a pleasure to note the number of visitors who have worked in the Herbarium on Tropical African problems. They include the following : —Mr. C. D. Adams, Prof. H. G. Baker, Mr. P. R. O. Bally, Prof. A. S. Boughey, Mr. I. H. Burkill, M. A. Cavaco, Dr. H. C. D. De Wit, Dr. J. G. Garcia, Mr. G. C. Gilbert, Prof. Dr. Emilio Guinea, Dr. F. R. Irvine, Dr. J. Léonard, Dr. F. A. Mendonça, Dr. J. K. Morton, M. C. Petit, Dr. G. Roberty, Prof. Dr. W. Robyns, Dr. A. Rocha da Torre, Dr. H. Scott, Miss A. C. Tallantire, Dr. A. R. Teixeira, M. Tournay, Dr. G. Troupin, Mr. B. Verdcourt. Frequent and welcome visits in connection with African problems were made by the botanical staff at the British Museum (Natural History) and of the Imperial Forestry Institute at Oxford.

As in previous years, a debt of gratitude is due to those botanists who have kindly determined tropical African specimens for us :—Mr. C. D. Adams, Mr. B. L. Burtt, Dr. C. E. B. Bremekamp, Mr. A. W. Exell, Miss M. E. Griffiths, Mr. A. C. Hoyle, Dr. J. Léonard, Dr. G. Schulze,

Prof. Dr. K. Suessenguth (whose untimely death during the year is a loss to African botany), and Mr. B. Verdcourt.

The A.E.T.F.A.T. Library remains at Kew in the charge of Mr. J. P. M. Brenan. In June 1955 the A.E.T.F.A.T. Index for the year 1954 was distributed to members.

South Africa. The incorporation of outstanding collections received from the Division of Botany, Pretoria, and from the Bolus Herbarium, Cape Town, is now practically complete ; those institutions continue to send valuable material and photographs further to enrich our collections.

A great number of routine enquiries concerning identifications requiring comparisons with type and other material have been dealt with by Mr. D. Killick, liaison botanist from Pretoria ; this greatly eases the work of the South African section which is now mainly concerned with curatorial work. Revisional work on South African *Asclepiadaceae* and *Rubiaceae*, in so far as they affect the *Flora of Tropical East Africa* and the projected *Flora Zambesiaca* has been continued and an account of one new species of *Tylophora* has been prepared for the *Flowering Plants of Africa.*

During the year, welcome visitors included Dr. Overkott of Munich, working on various genera of *Scrophulariaceae* and Dr. Gilg-Benedict of Berlin who is revising the genera of *Restionaceae* ; Prof. Isaac of Cape Town spent some time at Kew examining marine *Algae* and Mrs. Isaac also carried out some work on *Agapanthus.*

The very valuable set of coloured drawings of *Agapanthus* assembled by the Hon. Mr. Louis Palmer is now at Kew on permanent loan ; it is hoped that many of them will be published in Mrs. Isaac's monograph.

Some preliminary work for the *Flora of Southern Africa*, a long term project initiated by Dr. Dyer of Pretoria, has been carried out by Mr. Killick, who has also continued his revisional work on *Myrica* and *Eriospermum.*

Australia. A number of taxonomic and nomenclatural problems have been investigated during the year on behalf of Australian and New Zealand botanists engaged in the revision of their state floras. To avoid duplication of labour, these studies have been extended, where practicable, to include material in the Melville collection. In this way, an investigation of the Australian *Ranunculi* has been completed.

Routine naming of the Morrison collection of Western Australian plants has continued and material of the *Droseraceae*, *Umbellifereae*, *Proteaceae*, *Loranthaceae*, *Santalaceae*, *Euphorbiaceae* and a large part of the *Leguminosae* has been incorporated in the herbarium. About 1200 specimens received from the state herbaria of Australia during the year have also been mounted and incorporated. These included some valuable collections of *Leguminosae* and *Eucalyptus* from the Northern Territory and New South Wales, and a small but interesting collection from the remote South West of Tasmania. A display of *Eucalyptus* fruits, illustrating evolutionary trends and the diversity of form in the genus, which was prepared for the exhibition of " Art in the Service of Botany ", was afterwards exhibited to the public for six months in Museum III.

Among visitors, Miss C. Skewes from the National Herbarium, Melbourne, spent several months in the herbarium studying Australian mosses and Dr. F. J. F. Fisher arrived in December to study the *Ranunculi* of New Zealand.

America. During the year, arrears of specimens forwarded by the Forest Department of British Guiana were disposed of and a number of new species of trees were described. The collections of the late Christopher Sandeman (Argentina), Mrs. A. L. Blake (Patagonia) and Mrs. Fusa Sudzuki (Chile) were dealt with. A large number of specimens which had been lying for many years in the basement were incorporated in the Herbarium : these came from the collections of Skutch (Ecuador), Ewan (Andes of Venezuela), Hawkes (Colombia), Felippone and Osten (Uruguay), and Mrs. E. Vallentin (Falkland Is.). Above all, an excellent start was made on the identification and incorporation of the extensive arrears of the very large Hinton collections from Mexico. A consignment of specimens received from the Pretoria Herbarium included many numbers previously unrepresented at Kew of the valuable Steinbach and Fiebrig collections in Bolivia.

Studies of tropical American *Bignoniaceae* included the examination of the material in the Manchester University Herbarium, and the identification of specimens sent by the New York Botanical Garden, the Herbario Nacional Colombiano (Bogotá), the Instituto Agronômico do Norte (Belém), Mr. A. H. G. Alston (British Museum), Dr. A. Ducke (Brazil), Dr. Bertha Lutz (Rio de Janeiro), Dr. W. Rauh (Heidelberg) and Dr. Lyman Smith (U.S. National Herbarium).

Orchidaceae. As in previous years, many living plants were received for determination, both from the Gardens and from other growers, notably from Mr. L. M. Mason and from Messrs. Sanders. Routine determinations were also made of dried specimens from many countries, principally from Africa, especially East Africa in its broadest sense. These again included collections sent on loan from other institutions. A valuable set of over 300 photographic reproductions of drawings of Venezuelan orchids by Mr. G. C. K. Dunsterville were very kindly presented by him. These were accompanied by complete notes about the plants illustrated and had been determined by Dr. L. A. Garay of Toronto.

Research has been continued on African orchids in connection with the two African Floras now being prepared at Kew ; this was especially concerned with the genus *Polystachya.* So far as is feasible the work has included also investigations of the southern representatives of the groups concerned with an eye to their eventual inclusion in the accounts of the Angolan and Zambesi orchids for their respective Floras. The revision of the genus *Brachycorythis* was completed and the account has been published. Some research has also been carried out on Asiatic orchids so far as time has permitted ; a small paper is now in the press.

Amaryllidaceae. Work on this family for the Flora of Tropical East Africa has continued at intervals throughout the year, and in particular, a start has been made on the revision of the material of *Crinum,* perhaps the most difficult and critical of all the genera. It will certainly be

necessary to prepare a revision of the genus before an account of the African species can be given. Articles on the genera *Nerine* and *Hymenocallis* have been prepared for the Supplement to the R.H.S. Dictionary of Gardening.

Gramineae. As in past years, much time has been devoted to the identification of or reporting on very numerous specimens received from botanical and agricultural establishments or from private individuals in many parts of the World, but principally from countries of the British Commonwealth, especially from those in tropical Africa. The material received in this way contained a large number of uncommon or rare species and of well-preserved specimens, often from regions little known botanically, and has considerably enriched our collections. Many thousands of specimens of grasses have also been presented to Kew. The larger collections include :—a very valuable series of 335 duplicates from the Botanical Institute, Lisbon, collected by Welwitsch in Angola, containing many isotypes of the species and varieties described by Rendle ; important collections of southern African grasses from the National Herbarium, Pretoria ; a very large number of good specimens of Rhodesian grasses from the Salisbury Herbarium, S. Rhodesia ; a representative collection of mounted specimens of the interspecific and intergeneric hybrids of *Festuca* and *Lolium* spp., raised by Professor T. J. Jenkin and described in the Journal of Genetics, from the Welsh Plant Breeding Station, Aberystwyth ; Russian grasses from the Botanical Institute of the Academy of Sciences, Leningrad ; northern Australian grasses from the C.S.I.R.O., Canberra ; and northern American grasses from the Smithsonian Institution, Washington. In continuation of exchange arrangements, 2,880 duplicate specimens have been distributed to overseas botanical institutions.

Information has been supplied on a variety of subjects pertaining to the study of the grasses, such as their nomenclature, individual type-specimens at Kew and in the Linnean Herbarium, the classification of wild oats in the British Isles, sterility in *Spartina townsendii*, viability of grass-seeds, sources of grass-pollen in quantity, and of seeds of grasses of value for agricultural purposes, economic uses of grasses (lawn-grasses, sand- and mud-binding grasses), etc.

The preparation of the accounts of the family for the Floras of Tropical East Africa and of Tropical Africa has been continued, and in addition two new genera and several new species have been described.

Visitors who have worked on the *Gramineae* include :—Mr. B. Brand, Mr. W. Foster, Mr. W. Hirst, Prof. R. E. Holttum, Dr. A. Melderis, Dr. G. Roberty, Dr. W. Robyns, Mr. J. D. Snowden, Dr. R. R. Stewart, Dr. G. Troupin, Mr. V. D. Zotov.

Cyperaceae. Numerous collections of Tropical African *Cyperaceae*, including a particularly large and rich collection made by Mrs. H. M. Richards in Northern Rhodesia, were determined in 1955.

Much of the time during the past year was spent on the preparation of the Flora of Tropical East Africa. In this connection revisions of African species of *Hypolytrum* and of *Scleria*, Sect. *Hypoporum*, have been

published, and the account of the other three Sections of *Scleria* as represented in Africa has gone to press.

Miscellaneous problems and queries dealt with during 1955 are too many to detail here.

Vascular Cryptogams. Continued research work in connection with the Tropical East African Flora has been further assisted by a loan of 830 herbarium specimens from the private herbarium of Mr. H. D. van Someren. These have been collected mainly in Kenya and will provide useful distributional and other data.

Curatorial work has included a start on the re-arrangement of the genus *Dryopteris* sens. lat. into the smaller segregate genera recognized by modern taxonomists. This task is likely to be spread over several months.

Visitors during the year included Prof. R. Pichi-Sermolli, Mrs. Fern Crane, Prof. R. E. Holttum and Dr. W. A. Sledge.

No single collection of ferns calling for special mention has been received during the year.

Bryophyta. 257 East African mosses presented, collected by Dr. O. Hedberg.

Fungi and Lichens. Extensive collections of Aphyllophorales have been received for determination from Sierra Leone, Victoria, Papua and Brazil and a most valuable set of duplicates from Uganda has been presented by Mr. T. D. Maitland. Among exsiccati received in exchange during the year special mention should be made of long series from the Jardin Botanique, Geneva, from Mr. C. Sbarbaro, Spotorno and Mr. Asahina, Tokyo.

Provision of a new block of dust-proof cabinets has made it possible to reorganise the British collections of Uredinales, Ustilaginales, Pezizales, Helotiales and Phycomycetales.

The whole of the extraeuropean collections of *Ramalina* has been revised by Dr. A. H. Magnusson, who has recognized numerous undescribed species among tropical material hitherto assigned to european taxa. Dr. Hans Runemark has revised our lichens formerly filed under the collective name *Rhizocarpon geographicum.* Revision of the British Geasters has been commenced by Mr. J. T. Palmer.

Visitors who worked in the department during the year included Dr. C. G. Hansford (Australian fungi), Dr. P. Heinemann (tropical species of *Agaricus*), Dr. R. L. Steyaert (*Ganoderma*), Dr. A. R. Teixeira (*Polyporaceae*) and Mr. P. D. Orton (Pearson collection).

The assistant mycologist organised the Spring Foray of the British Mycological Society at Tring. The Senior mycologist represented Kew at the Jubilee Meeting of the Danish Mycological Society at Copenhagen, from 30th September to 5th October.

Algae. In addition to British material submitted for identification several useful collections have been added to the herbarium during the past year. Miss M. Naylor presented a fine set (120 specimens) of Australian and

New Zealand seaweeds, together with some excellent photographs ; sixty six specimens collected in the neighbourhood of Hongkong were received from Miss B. Chiu ; these included carefully selected series of *Sargassum* specimens correlating male and female plants and showing different stages of growth. Two valuable collections from Malindi, Kenya were sent by Dr. E. M. Lind and Dr. P. J. Greenway, the latter collection made by Mr. C. van Someren. Miss Foster Barham presented an album of New Zealand seaweeds.

Visitors to the department during 1954 included Dr. Y. Yamada, Director of the Botanical Institute, Hokkaido University, Japan—his second visit to Kew after an interval of 25 years. Miss B. Chiu (Hongkong University) visited the herbarium during the summer vacation and continued her work on Chinese seaweeds. Miss M. Fox (Ibadan University) paid several short visits to study West African material. Professor Isaac (Cape Town University) came towards the end of the year to examine the historic collections from South Africa.

Thanks are due to Mr. G. O. Allen for his kind assistance in naming Charophyta.

Spirit Collection. Once again over 1,200 gatherings were added to the collections. These included material from all parts of the world but especially from Africa. As in other years the greatest increase was in the family *Orchidaceae* but considerable additions were also made to the families *Asclepiadaceae*, *Liliaceae*, and *Commelinaceae* and of the genus *Podocarpus*. Spacing out of the collections into additional cabinets is still in progress and should help to relieve the congestion in some parts of the collection.

Carpological Collection. Many additions have been made during the year, and accommodation is now becoming a problem. The provision of two extra cabinets has helped to relieve the congestion.

Fumigation Apparatus. The large fumigation chamber was used on 13 occasions during the year : the small chamber on 50 occasions. New heaters were installed in the large chamber at the beginning of the year.

The use of the small chamber was discontinued in October as it was considered desirable to house it outside the precincts of the Herbarium. Accommodation was provided on a site adjacent to that occupied by the larger apparatus though the chamber itself had not been transferred when this report was prepared.

Index Kewensis. Good but necessarily slow progress has been made. With the recent provision of a whole-time assistant, the compiler hopes to make great strides during the coming year.

Nomenclature. A great number of enquiries have been dealt with. Some of these involve a great deal of bibliographical research which would be much reduced if correspondents would give all relevant information available to them. A few correspondents have submitted very long lists of names for verification without giving any information as to the purpose or source of the names included in them. The only checking that can be

undertaken in such circumstances is spelling and author ; the checking of the synonymy and legitimacy of the names submitted in such lists cannot be undertaken since this involves extensive taxonomic and bibliographic research which should be carried out by the enquirer himself.

Botanical Magazine. Parts 3 and 4 of volume 170, N.S. tt. 242–263, edited at Kew by Dr. W. B. Turrill, for the Royal Horticultural Society were published in 1955. Of the 22 articles, 15 were contributed by the members of the Herbarium staff and the preparation of these necessitated a great deal of original and bibliographical research. The President and Council of the Royal Horticultural Society have presented the originals of the coloured plates and black and white text figures to the Kew Herbarium.

The Library

The routine work of the library has been carried on as in previous years and queries from all over the world have continued to arrive in a steady stream, often involving considerable bibliographical research. Every effort has been made to meet the requirements of the staff and of correspondents.

During the year over 400 volumes were sent to the binders, and the continuation of the special grant has enabled us to make still further progress with arrears.

Considerable attention has been devoted to the preparation of the classified catalogue which is becoming increasingly useful to members of the staff.

Our records show that in addition to parts of periodicals over 1,100 accessions were made to the library during 1955. We are greatly indebted to various authors, members of the staff and others for publications generously presented. Many books have been received from the publishers for review in the Kew Bulletin, while the continuation of a number of periodicals has been received in exchange for the Kew Bulletin and Hooker's Icones Plantarum. We have also received other publications in exchange for duplicates.

The overcrowded condition of the library shelves, repeatedly emphasized in recent years, has been temporarily relieved by the removal of certain periodicals to shelving in the basement and the Museums. Until a new building is constructed and equipped to house the library it is impossible to improve the position permanently.

Many visitors to the Herbarium have used the facilities of the library in the pursuit of their studies, some for considerable periods.

As in previous years we have continued to make loans to Government Departments and Agricultural Bureaux while on occasions we have borrowed from other libraries certain publications for the use of members of the staff.

We are grateful to the Bentham-Moxon Trustees who have generously presented us with volumes 4 & 5 of the Keller-Schlechter Monograph on European Orchids published as Sonderbeiheft A of Fedde, Repertorium Specierum Novarum Regni Vegetabilis, thus filling a gap in our set

of this important publication. The Trustees of the Stapf Memorial Fund have kindly presented another part of " The Orchids of Australia " by W. H. Nicholls.

The library has been still further enriched by numerous contributions from societies, academies and similar institutions all over the world, while members of the staff and many other authors have presented reprints of their botanical papers.

We are again indebted to the Photographic Section of the Ministry for providing us with photostat copies of valuable publications and photographs from negatives taken on various expeditions or kindly lent to enable us to make copies for the collection. Our thanks are also due to the War Office, Ordnance Survey, and others for generously presenting further valuable additions to our collections of maps and drawings.

Department of Economic Botany

Museums of Economic Botany.

The number of enquiries concerning economic plants and plant products that were dealt with by correspondence during the year was about the same as in the previous year. There were however a greater number of visitors requiring information and a larger number of enquiries received by telephone.

Personal enquiries were of a varied nature and included such matters as—methods of cultivation, harvesting and storage of Indian rape or toria : present day uses of " mimosa " or wattle bark extract and other vegetable tanning materials in the leather industry : the early history and uses of senna : *Testudinaria* and Mexican species of *Dioscorea* of use in the preparation of cortisone : economic plants suitable for cultivation in a proposed new botanic garden in Cyprus : the winged seeds of *Macrozanonia* and the interest attached to them in connection with aeronautics and gliding : the use of Sorghums, notably Columbus grass (*Sorghum almum* Parodi), for fodder and the possibility of growing Sorghums all the year round in this country (under glass) for work on the Sorghum midge.

The miscellaneous enquiries dealt with by correspondence covered a wide range and included the following—possible causes of seeds in present commercial supplies of currants from Greece on sale in the United Kingdom : (It is known that optimum growing conditions and heavy manuring may induce seed formation in the currant vine) : the identification of vegetable debris causing the fouling of water meters in the Persian Gulf region : identification of medicinal and culinary herbs of various kinds including several commercial samples of buchu, *Agathosma* (*Barosma*) from South Africa : a Chinese drug, said to be used as a substitute for santonin was found to consist of the dried fruits of *Quisqualis indica* L. : samples of Cyprus thyme and marjoram were found to be respectively *Thymus capitatus* (L.) Hoffm. and *Origanum dubium* Boiss. and *O. majaranoides* Willd. : a plant suspected of being poisonous to livestock was *Senecio erucifolius* L. while *Picris echioides* L. was suspected as a cause of dermatitis : the value of species of *Zizania* (wild rice) as food for wild fowl : seeds and fruits of various kinds for identification included several

fresh fruits of the swamp milkweed (*Asclepias syriaca* L.), and it would seem that in certain Continental countries these are now a favourite table decoration resembling as they do small birds or budgerigars when suitably arranged.

The work of resurfacing the larger timber specimens in the Museums has continued steadily during the year. A large number of additional hand specimens of timbers was incorporated in the reference collection. These were mainly of east and tropical African origin. They included a special set of Somaliland woods.

Other noteworthy donations received during the year were some fifty samples of medicinal and culinary herbs, a collection of soya beans and soya bean products, and a map showing the distribution of tobacco cultivation throughout the world, kindly supplied by an American tobacco firm.

The herbarium collection of hardy trees and shrubs, which has been housed in Cambridge Cottage for the best part of half a century, was transferred to Descanso House at the end of the year. This collection, which included many economic plants and notably a large collection of Conifers, had been built up mainly by former members of the Museum staff. The additional wall space afforded by its removal is to be used for books and periodicals for which accommodation is urgently needed.

The Keeper continued his studies on the history and origin of certain tropical and subtropical fruits and published some of the results during the year. Mr. T. A. Russell completed the writing up of his intensive work on Kola in Nigeria which was also published. This is doubtless the most comprehensive and informative account of Kola that has so far appeared in English. It includes well authenticated records in regard to yields with Kola.

Introduction and Distribution of Economic Plants.

The propagation of plants in the Quarantine House was continued actively and the space remained fully occupied, mainly by cacao. The distribution of selected trees of Trinidad cacao and Amazonian Forasteros, originally supplied by the Imperial College of Tropical Agriculture, was continued to Ceylon and Fiji. A start was made in propagating seedlings of *Theobroma* and *Herrania* derived from the collecting expedition to Colombia in 1952, and consignments were sent to the Gold Coast, both by air and in wardian cases by sea, for the use of plant-breeders of the West African Cacao Research Institute.

The maintenance of cacao plants in good health under glass-house conditions at Kew still presents its difficulties. Some nutritional disturbance is apt to appear, but whether associated with the compost in use or due to some fault of the artificial climate is not yet clear. Symptoms of ill-health became marked in some plants during the heat of the summer, and were aggravated by an invasion of spider-mites which found their way into the house. Distribution of plants was accordingly suspended in the latter half of the year until the cause could be ascertained and the plants restored to full health.

A welcome addition to the cacao collection was the tree Lafi No. 7 from Samoa of which several rooted cuttings were kindly sent in a wardian

case by the Manager, New Zealand Reparation Estates. This is a high-yielding tree which has received some publicity, since its pods have been described as escaping infection from blackpod disease due to *Phytophthora palmivora* at times when neighbouring trees suffered severe attack. It remains to be proved that the tree possesses any inherent resistance to the disease, but there will be no lack of interest in giving this clone a trial in cacao-growing areas where blackpod regularly destroys a large part of the crop.

The Quarantine House in which the cacao is grown continues to be financed under a Colonial Development and Welfare Scheme, and the period of this grant has now been extended to 1960.

During the year under review the banana-house, built in 1927 with Empire Marketing Board funds and now in a decayed state, was taken down and replaced by a spacious house for the growing of banana plants. This was at once put into service to receive a number of Musas collected by Mr. N. W. Simmonds in the East Indies. Rhizomes travelled in excellent condition from Malaya but some losses occurred amongst those which made the very long journey from New Britain. After a period of quarantine, the plants are to be forwarded to the Imperial College of Tropical Agriculture for use in banana-breeding.

Amongst plants of economic importance distributed to Commonwealth countries were grape-vines of Sultana type which were sent to St. Helena for trial as a possible new crop. The material was supplied by the Director of Agriculture, Cyprus, as cuttings which were rooted at Kew and shipped after a year's growth. Seedlings of Brazil-nut (*Bertholletia excelsa* Humb. et Bonpl.), from seed coming from Brazil and Trinidad, were sent to the Gold Coast and Nigeria for trial under West African conditions. The first batch sent to Nigeria was destroyed in an aircraft disaster. Although plants sent out from Kew through the years have encountered many hazards, this consignment is believed to be the first lost in this way.

Seed of *Shorea gysbertsiana* Burck. the illipe nut of commerce, was received from Malaya to be germinated at Kew and forwarded subsequently to West Africa for planting in the forest zone. Illipe nuts yield a fat resembling cocoa-butter in some of its properties, and larger and more regular supplies are likely to find a good market.

Mr. T. A. Russell attended as an official delegate the 14th International Horticultural Congress held at Scheveningen in the Netherlands, at which papers were read and discussions held on plant propagation, the growing of tropical crop-plants, and other horticultural subjects of interest.

Jodrell Laboratory

Research connected with the forthcoming publication of a 3 volume book on the systematic anatomy of the Monocotyledons has been continued throughout the year. The whole of the illustrations for the first volume, which will deal with the anatomy of the Grasses, have been completed. The Keeper has also written a considerable part of the introductory portion of the text of this volume, and has completed preliminary descriptions of all of the species of Gramineae that are repre-

sented in the reference collection of slides. These descriptions are now undergoing their final revision. There are good prospects that the whole text of the volume on Grasses will be well advanced towards the end of 1956.

Other work on the anatomy of Monocotyledons has included the following :—Mr. P. B. Tomlinson, a visitor from Leeds University, completed his work on the comparative anatomy of the Zingiberaceae, and has written an account of it which has been accepted for publication in the Journal of the Linnean Society. He also made some preliminary observations on the structure of Palm leaves. Miss E. Smithson, a visitor to the laboratory, has made a thorough investigation of the anatomy of the Flagellariaceae, and is preparing an account for publication. Arrangements have also been made with Mrs. C. Gilg to prepare an account of the anatomy of the Restionaceae for inclusion in the book. Dr. M. Y. Stant has continued her work on the Alismataceae whenever circumstances have permitted.

The routine work has been rather more voluminous than usual, and, during the year, about 260 samples and specimens have been received for identification by microscopical methods. Some of the most exacting work has been the identification of archaeological material excavated at Jericho, and submitted by Miss Kenyon from the Institute of Archaeology. The investigation of material from a Roman well at Chew Park, which was started in 1954 at the request of Mr. L. Biek of the Ministry of Works, was continued in 1955, when further specimens were examined.

Amongst the more unusual items received for identification from various sources, during the year, were a " seed " from East Africa which was shown to be of animal origin ; fibrous material used by certain birds in Eritraea for making their nests, which was identified as probably derived from one of the Asclepiadaceae, whilst some curious looking green coloured wood from Thailand was found to be derived from a species of *Terminalia*, the green colour being due to a fungus in the wood. The bookcases in the library at Trinity College, Cambridge, which were traditionally believed to be made of Cedar, were shown to be made of English Oak.

The Keeper continued to serve on the " Crude Drugs Committee " appointed by the British Pharmacopoeia Commission to assist in revising the British Pharmacopoeia. A number of suggestions which he made for improving the descriptions of the microscopical structure of some of the drugs, as well as revised drafts of certain parts of some of the monographs which he submitted, have all been accepted by the Committee and by the Editor of the British Pharmacopoeia.

Mr. Richardson and Miss Catling, apart from making microscopical preparations of the material received for identification, have also added numerous microscope slides to the reference collection. These have included 378 slides of 189 samples of wood, chiefly from Malaya and Tropical Africa, as well as 72 slides representing 15 species of 10 genera of Restionaceae. In addition a further 114 slides of Cyperaceae have been added to the collection, now making a total of 254 slides representing 22 genera and 55 species of this one family.

An electrically operated machine for sharpening microtome knives has been specially made for use at the laboratory. The machine is a slightly modified form of one that was designed for use at the Imperial Forestry Institute at Oxford, where it has been found to give satisfactory results. The machine at the Jodrell Laboratory has only recently been received, and has not yet been thoroughly tested, but it is hoped that it will simplify the onerous task of keeping microtome knives in first class condition.

The following visitors have worked at the laboratory for brief periods during the year :—Mr. P. B. Tomlinson (Zingiberaceae and Palmae) ; Miss E. Smithson (Flagellariaceae) ; Mrs. C. Gilg (Restionaceae) ; Mrs. Chiterley (Comparison of Monocotyledons with fossils) ; Mr. Brett (timber slides for comparison with fossilized woods).

The Gardens

With a total rainfall of 19·74 inches the year was a great contrast to 1954. April, July, August were exceptionally dry months but May proved the wettest month of the year when a total of 4·22 inches fell. Despite this however the attendance of 230,388 during this month attested the springtime interest. Requests for advice both in person and by letter continue to increase as does the request for seed material from outside sources. Over 12,436 packets of seed were despatched during the year.

Arboretum Department

Arboretum

The drought experienced during July and August necessitated almost continuous use of the water hydrants and many extra hours of overtime had to be worked in order to water not only the smaller and more recently planted shrubs and trees, but also established specimens. Despite poor water pressure in some parts of the grounds and the lack of hose-pipes, only slight losses have occurred amongst the younger trees and shrubs, but it must be emphasized that the full effect of the drought and possible die-back of the older trees cannot be fully assessed until next spring.

As in previous years, there were instances of large limbs being shed from some of the older trees without warning. Fortunately no injury or damage was suffered by workmen or the public, although in one instance, a visitor and his children narrowly escaped injury when a very large limb fell from one of the old Sweet Chestnuts along the Boathouse Walk. Notices warning the public of this danger are permanently displayed at the entrance gates and seats are no longer placed beneath trees in the wooded areas. These precautions do not eliminate the danger because visitors often move seats, especially the smaller type, to shady positions beneath or near to the larger trees.

Losses amongst the older trees continue and during the year a total of 14 large trees have been removed because of their dangerous condition. In addition, 12 smaller trees have also been removed, chiefly because of damage by weather or by disease. A number of the poor specimens in the *Prunus* and *Pyrus* collections have been replaced by trees propagated in the nursery for the purpose and similar action has been taken in the *Deutzia* and *Ribes* collections.

Additional young trees have been added to the Salix collection and the area in the Queen's Cottage Grounds that was affected by the collapse of the boundary wall some years ago, has now been replanted.

A further planting of Camellias was added to those forming the collection adjacent to the Flagstaff. Altogether, over 100 varieties are now represented in this collection which extends from Unicorn Gate to the North Gallery. In addition to the various varietal forms of *C. japonica*, there are the newer hybrids of *C.* × *Williamsii* and also the various Japanese varieties of *C. sasanqua*—all of which it is hoped will provide a spectacular display within a few years.

At the King Williams Temple, regrouping and planting of the Rhododendrons and allied genera have continued. Provided weather conditions are suitable, the bulk of the planting will be completed by the spring of 1956. Thinning out of Rhododendrons in this area and also in the woodland collection has provided some excellent specimens for the new planting at the south-west end of the Rock Garden.

Near to the Australian House, a number of *Eucalyptus* spp. have been planted out amongst the *Ilex* and other trees. It is hoped that with the protection thus provided more Eucalyptus will become established outside and provide an interesting adjunct to the Australian House.

Rabbits which for many years have been a serious pest in the Arboretum and other parts of the gardens, are now greatly reduced in numbers. The disappearance of the rabbit leaves no regrets for every year many young shrubs and trees were damaged or killed by them and losses were so severe in the Arboretum Nursery that it became necessary to fence it in with wire netting. Rats, Grey Squirrels and Wood Pigeons continue to be a source of trouble, the latter having appeared again this autumn in very large numbers to feed on the acorns of the Holm Oak and also other fruits. Records of the numbers shot during the year have been carefully kept, and are as follows :—Rats 28, Squirrels 104, Wood Pigeons 294 and 210 rabbits. In addition 257 dead rabbits were picked up.

The production and collection of tree and shrub seeds has again been very good. Altogether seeds from 73 different natural orders (families) 230 genera and 1400 species were collected, this being slightly lower than the numbers collected during 1954. Good use has been made of the cold room and refrigerator and it is pleasing to report that many of the oily and other types of seeds, that previously could only be stored for a month or so under ordinary seed room conditions, can now be kept in good condition for almost the entire year. Germination tests with these and other stored seeds, especially Acorns, have given very good results and useful data has been obtained. Further experiments are, however, necessary before a detailed report of the results can be published.

The number of packets of seeds of trees and shrubs distributed during 1955 number 6,068, this being an increase of over 400 on the previous year, also 47 consignments of living material were sent to Botanic and other Scientific establishments at home and overseas. Over 120 consignments of seeds and living plant material were received for the Arboretum Nursery during the year. One consignment included 78 packets of seeds collected by Stainton, Sykes and Williams on the 1954 Nepal

Expedition and were received via the British Museum and the Royal Horticultural Society.

Specimens of trees and shrubs referred to the department for identification during the year numbered 471, this being 200 less than in 1954.

As in previous years the general display of flowering trees and shrubs was again very good. Some injury to early flowering Rhododendrons and other subjects resulted from frosts and cold winds, but the damage was less severe than that experienced early in 1954.

The displays of Magnolias, Rhododendrons (including the Azaleas) *Prunus*, *Malus*, *Philadelphus*, *Deutzia* and also the various species and hybrids of Rosa were excellent. The large tree of *Magnolia campbellii* near Unicorn Gate was again one of the features of the year, with 140 of its large rosy-pink flowers out at one time, while later buds continued the display. Also of outstanding merit were the collection of Hamamelis, just off the Holly Walk. *Viburnum grandiflorum* and *Halesia monticola* var. *vestita* were noteworthy, the latter making a fine display near the Pagoda. The tall pyramidal specimen of the hybrid *Eucryphia nymansay* flowered freely for the first time at Kew and will probably continue to do so, now that it has matured.

The treatment of paths with cold Asphalt has continued and the entire central path through the gardens, from the top of the Holly Walk to the end of the Princesses Walk near No. 3 Museum has now been treated during the past three years. Certain sections of other walks that had become worn were treated by the ordinary spraying with bitumen and chippings.

Mechanical equipment purchased in past years continues to play a most important part in the work of the gardens generally. The cutting of the rough grass areas, has been speeded up by a motor scythe. There is, of course, more rough grass to be cut, because with so many of the large trees removed from the wooded areas, the increased illumination has encouraged the growth of grass. Additions to the mechanical equipment during 1955 include a Motor Chain Saw with attachments for either 7 ft. or 4 ft. saws, and an electrically driven metal lathe for the artificer's use in the Machine Shop.

Another section of the old cobbled surface of the stable yard has been lifted by the Ministry of Works, and the area prepared for concreting.

Work on the card index with recording and measuring of trees, etc., has been recommenced after a lapse of nearly twelve months.

Composting experiments have continued with coffee residue, grass mowings and leaves, using nitro-chalk and malt dust as accelerators.

Labour is still one of the chief problems and it is almost impossible to get the right type of man for even labouring work. Altogether there have been 12 changes in the Arboretum staff during the year.

Botanics

In this section of the Arboretum Dept. a number of alterations have been carried out during the year. In addition to alterations to several shrub borders and beds, a realignment of the path near that well-known landmark, the Stone Pine, was necessary, in order to preserve the

large limb overhanging the path, from damage by passing coke lorries. This necessitated the removal of several beds of shrubs but fortunately the type specimen of *Rosa hugonis* growing nearby was not affected.

During the spring, several of the old specimens of Quercus Ilex growing in the Cumberland border were removed and the space provided used for the thinning out and replanting of Camellia bushes.

Floral displays in this section of the grounds were again very good and many of the large beds of Rhododendrons along the Broad Walk flowered with remarkable freedom. The Lilacs (Syringa) were also outstanding, and it is necessary to draw attention to the young collection of modern single-flowered varieties planted a few years ago at the junction of the Princesses' Walk and the Cart Road. Many of these young trees flowered profusely and the varieties were of great interest to the public.

The ground beneath the older group of Lilacs on the Main Gate Lawn, has been planted with mixed Crocuses, which should prove an attractive feature in the spring.

The shrubbery near greenhouse No. 1, altered and replanted two years ago, contains a number of interesting trees and shrubs. The small specimen of *Helwingia japonica* produced many of its small pale green unisexual flowers. This subject is of great botanical interest because of the anomalous position of the flowers, which appear to be borne in the middle of the leaves. The young tree of *Pterocarya rehderiana* is growing strongly and promises to make a fine specimen. Shrubs of *Symplocos paniculata* and *Decaisnea fargesii* are also growing freely.

Other outstanding flowering shrubs that can be mentioned are, *Viburnum bodnantense*, a hybrid between *V. fragrans* and *V. grandiflorum*, *Forsythia ovata*, and *Philadelphus Beauclerk*.

Japanese Cherries, again provided a wealth of flower while the Crab mound near No. 15, and the various specimens of *Wistaria* also flowered with great freedom.

Temperate Department

Temperate House

The resoiling of a bed in the Himalayan House, mentioned as being in progress in the last Report, was duly completed. Replanting of this bed provided an opportunity for the rearrangement of many of the tender Rhododendrons. Several plants which were becoming too tall for the Annex (notably a large *R. ciliicalyx*) or for the outer beds of the Himalayan House, were moved into the newly prepared bed, and there were consequential moves throughout the Department.

The fourth and last of the centre beds in the Himalayan House is being resoiled this winter, and the largest plant on this bed, a specimen of *Rhododendron arboreum* 23 feet high, which through previous overcrowding was growing 30° from the perpendicular, has been undermined and lifted with jacks to the vertical position.

In the centre block of the Temperate House, a specimen of *Erythaea armata* which had been declining for many years was removed. This provided a chance to dig a large soak-away to improve the drainage of

this bed, and a young *Washingtonia filifera* var. *robusta* has been planted here to provide an eventual replacement for the older plant which is now almost touching the roof.

There has been a further increase in the seed collection, and the demand for seed from this department also increases. In 1955, seed of 265 species and varieties was collected, and 1,148 packets were distributed. The corresponding figures for 1954 were 225 and 775.

Fewer specimens have been referred to the Department for naming, 151 being dealt with in 1955 against 199 in 1954.

Pimelea spectabilis and *Musschia wollastonii* received Cultural Commendations when exhibited at R.H.S. Shows, and a pot plant of *Banksia serrata* with two inflorescens was also shown.

Seven plants from the Department have been figured for the Botanical Magazine during the year, viz. *Rhododendron siderophyllum*, *Cytisus stenopetalus*, *Hibiscus huegelii*, *Wahlenbergia bicolor*, *Ceratopetalum gummiferum*, *Callistemon brachyandrus* and *Cassia stipulacea*. Other plants which have attacted special interest include several of the tender Rhododendrons, notably *R. ciliicalyx*, *R. lindleyi*, *R. scopulorum* and *R. veitchianum* : two climbers, *Hidalgoa wercklei* and *Phaedranthus buccinatorius* : *Musa basjoo* which has been reintroduced to the Temperate House whence it was figured for the Botanical Magazine many years ago ; and *Eucalyptus macrocarpa*, the largest flowered of its genus, produced its first bloom in December at the age of 7 years with the promise of more to follow.

The heating of the north end of the Temperate House has improved since alterations to the hot water system were carried out during the summer, and the erection of a glass partition between the North Octagon and the main block of the Temperate House has greatly reduced the draught at this point, a change which is already reflected in the improved condition of the ferns on adjacent beds.

Decorative Department

Flower Gardens

During the spring of 1955, most flowering subjects did well as in the past, the main item of interest was the spring bedding display consisting of early flowering and Darwin Tulips to be seen on the Palm House Front.

Short spells of hard frost during February, caused slight damage and losses among certain varieties of the winter flowering Pansy, but fortunately did not spoil the May display.

Owing to the drought which prevailed throughout the summer months, it proved most difficult to maintain sufficient moisture in the beds to enable the summer bedding subjects to get established. During the whole period between June and the end of September, the flower garden staff did little else but water beds and borders, and for the first time in the history of the department, it was found necessary to bring in two men on night shift work for this purpose.

The Palm House bedding area gave little trouble, the beds being so situated, that watering was carried out each night by means of two sprinklers.

The entire Pelargonium collection was for the first time housed in the Palm House front beds and gave a very colourful display throughout the season, these plants benefiting from the hot day conditions.

The beds of tuberous Begonias in the proximity of House No. 4, once established, gave colour throughout the season and the subjects on the Broad Walk section, namely, Calceolarias, Plumbago capensis, Petunias, Fuchsias, Dahlias, Cannas, Verbenas and *Streptosolen jamesonii*, all gave a satisfactory display with the exception of four varieties of Penstemons which failed to make growth or flower well.

The Rose Garden

The early show of colour in this section which is usually to be seen during the second week in June, was delayed this year owing to the cold east winds which prevailed right through until the first week in June, the first crop of bloom being at its best during the second and third weeks in July.

The dry winter conditions and the February frosts caused a considerable amount of damage to many varieties of roses and this was most noticeable as the summer progressed, die-back being very prevalent. During the winter months of 1954–5 season, the Rose Garden was enriched by the addition of nine new varieties, each bed being re-soiled before planting. A top dressing of compost was applied to all beds after pruning in March and proved most beneficial in the hot dry summer which followed.

Conservatory

In this section the standard display of greenhouse plants such as *Cyclamen*, Cinerarias, Gloxinias, Hippeastrums, *Euphorbia* (*Poinsettia*), Primulas, *Streptocarpus*, *Narcissus*, Hyacinths and Winter flowering Begonias was excellent. During the autumn the Chrysanthemums were colourful, although many varieties suffered from continued drip during wet weather and failed to remain in bloom longer than a few days.

Maintenance and Repairs

Various repair works were carried out during the year and in House 21B in the Melon Yard, the erection of collapsable staging around the sides of the house will greatly relieve the shortage of stage space in the department.

The potting shed was improved by the installation of a completely new frontage throughout the entire length of the shed. Houses 18D, 18E, 18G, 18I, 19, 20, 22, 23 and 23a were all painted on the outside during the early part of the year. House No. 4 was painted both inside and out, the interior paint being pure white, which has improved the light conditions in this house considerably. Houses 18D, 18E, 18H, and 19 have all been fitted with new lath blinds during the year.

Apart from this work, no other new or major repair work has been carried out in the department.

During the year, 108 entries were recorded as having been received by the department, consisting of rooted plants, cuttings or batches of seed.

Tropical Department

Orchid Houses

During the past few years the general cultivation of the Orchid collection has greatly improved, this is no doubt due to better potting material being available, and to permanent members of the staff being responsible for this valuable collection of plants. In early spring and throughout the summer months there was a fine display of Orchid blooms in the public showhouses. Orchids of special interest which flowered during the year were : *Disa grandiflora*, *Coelogyne eberhartii*, *Dendrobium crumentaum*, *Encyclia aromatica*, *Diaphananthe kamerunensis* and *Chelonistele sulphurea* Consignments of Orchid plants were received during the year from :— Mrs. H. M. Richards, N. Rhodesia, G. Kern, Brazil, A. D. Thompson, Georgetown, British Guiana, Glasnevin Botanic Garden, Forest Research Indo-China, and Liverpool Parks Department.

The following Orchids were shown at the Royal Horticultural Society's Shows in London, and received cultural commendations, *Maxillaria picta* and *Maxillaria luteo-alba*.

T. Range

It is very interesting to note the vast improvement in the general conditions of the plants in the new Teak houses, which were erected last season. The improvement is due to the additional light provided and better heating facilities, and the absence of uncontrolled ventilation, essential factors necessary to keep these exotic plants in healthy condition.

South African House

The raised beds in this house were overhauled at the end of the summer, many of the old over grown plants of Cotyledons, Haworthias and Gasterias, were removed for propagation. In their place new specimens were planted, also at the same time additional plants were added to the collection, these included : Argyrodermas, Conophytums, *Lithops* and Euphorbias. Many of the mimicry plants such as Conophytums and *Lithops* flowered lavishly after the exceptionally hot summer.

Ferneries

No. 2 Ferneries was rebuilt in Burma Teak, on the original foundations during the summer months. The new house has been designed to provide better growing conditions, and the maximum amount of light during the dull short winter months. The increased light was attained by removal of the roof lantern, reducing the glazing bars and fitting larger panes of glass. The side stages were all renewed in concrete and fitted to allow a free passage for heat to rise up at the back of the stages. The hot water pipes were all renewed and fitted on new iron bearers. The new Selaginella cases when completed, should provide ideal humid conditions for these plants.

Valuable fern material and spores, were donated during the year by Dr. J. K. Morton, plants collected in British Cameroons ; Miss Tindale, Sydney Botanic Garden, and the British Museum, Natural History Section, spores collected in Nepal. We have been successful in raising the following difficult ferns from spores this year : *Gleichenia linearis*, *Cyathea woolisiana* and *Cyathea baileyana*.

No. 3 *Ferneries*

The exterior of this house was repainted during the autumn.

No. 5 *Succulent and Cacti House*

Although this house was cleared of all plant material in readiness for the builders on 1st November 1954, demolition work did not commence until the 2nd May, 1955 and at the end of 1955 only the low walls and the rain water tank have been completed, and the main girders erected. The long delay in the construction of this house has caused considerable inconvenience to the working of the department. The large collection of succulent plants are scattered in various other houses, the maintenance and cultivation of these plants is becoming more and more difficult as time proceeds. Having been in their present position for over twelve months many of them require overhauling and more room to develop, but this cannot be provided under the present circumstances.

No. 1 *House*

The Ministry of Works renewed one of the large lights which was badly decayed at the back of this house, and have cleaned the roof glazing bars on the outside, using Secomastic in place of top putty to make the roof lights waterproof.

Palm House

Work in preparation for the renovation of this house went ahead in early spring. The tubs of many of the large specimen Palms and Pandanus plants in the north end had to be overhauled, new tubs and bases fitted where necessary in readiness for moving to the south end. The task of clearing the plants from the north to the south end commenced in April, and when cleared the contractors erected a partition cutting off the middle section. The partition was fitted with two large doors to enable the plants to be moved back when the work on this portion was completed. Renovation work on the north end went on throughout the summer and autumn months. The roof of the stokehold was cleared and a new reinforced concrete roof fitted and ashphalted. During this operation the hot water mains in the stokehold and the hot water pipes under the middle gratings were taken out, cleaned, overhauled and refitted on new beams utilising new pipes where necessary.

The iron structure was cleaned and repaired, thoroughly painted and then reglazed with larger panes of specially curved glass, which cut down the number of overlaps and provided more light and less draught. In early November the reconstruction of this section of the Palm House was completed. Work commenced immediately clearing the plants from the south end to the north in readiness for the work on that section to proceed. Before the second partition could be erected at the south end, it was necessary to move the following large specimen plants which were permanently planted out in beds near the roof of the south stokehold : *Arenga saccharifera*, *Wallichia densiflora*, *Saraca indica*, *Brownea macrophylla* and *B. crawfordii*. Special tubs were made by the Ministry of Works for *Brownea crawfordii* and *Saraca indica*. The largest tub was over six foot square and was used to house the very old specimen of *B. crawfordii*, which was planted in the Palm House over sixty years ago. This fine old

specimen was donated to Kew on the death of the raiser the late W. H. Crawford of Lakelands, Cork in 1888.

It is interesting to record the success in rooting two pieces of *B. crawfordii* by air layering. The largest piece took two years to root freely and the smaller piece eighteen months. The former was taken from the parent plant just before it was moved, and up to the present looks very healthy. Although we have rooted this plant in the past from cuttings during the summer months, we have never been successful in getting them sufficiently established to pass through our dull winter months.

No. 15 *Water Lily House*

External painting was carried out during the summer months. In autumn this house was closed to the public earlier than usual, and cleared of practically all plant material in readiness for interior painting. It was necessary before this operation could be carried out, to remove all the soil from the side benches, the large climbers had to be potted and tubbed, and taken into the Palm House. The Lily tank was emptied, and the late flowering water lilies were transferred to House No. 10 for the time being. Although the iron work in many places is in poor condition the complete painting should prolong the life of this house for a further few years, and provide additional light for the plants during the dull winter months.

Tropical Pits

During the year 1955 large consignments of seeds were received of which over 150 packets came from the Kew Herbarium. Germination on the whole was good and many plants were successfully raised. Several should prove valuable additions to the living collections, and help to augment the material provided for Herbarium specimens. Seeds of *Bertholletia excelsa* were raised and 24 seedlings were despatched in a wardian case to the Director of Agriculture, Gold Coast. Throughout the spring and summer months, it was necessary to continue the propagation of the various climbers and other plants which are permanently planted in the Palm House and which owing to the renovation work had to be removed. Plants of *Rauwolfia serpentina* and *R. vomitoria* have been vegetatively propagated from material received two years ago from Calcutta, and Peradeniya, and these will be ready for distribution next year. Seeds of a valuable timber tree, *Shorea gysbertsiana*, were received in early December from the Forest Research Institute, Kepong. F.M.S. These large seeds germinated in five to six days, and the first consignment was sent by air to the Director, West African Oil Palm Research Institute, Nigeria. The remainder of the seedlings are being grown on at Kew for despatch next year.

During the autumn interior painting was carried out on the following tropical pits Nos. 17A, 18A, B & C. A white rubberised paint was used, this has greatly increased the winter light which should prove beneficial to the exotic plants in these houses. During the year the following plants were exhibited at the Royal Horticultural Society's shows in London and both received an Award of Merit :—*Begonia coralicta* and *Pleiocarpa mutica*.

Plant material despatched :—

2,477 Packets of indoor seeds were distributed.

Wardian case of stove and greenhouse plants to the Director, Agriculture Department, Nijala, Sierra Leone.

Collection of Orchid spp. and varieties to the Curator, Glasnevin Botanic Garden, Dublin.

Collection of Orchids and stove plants, to Berlin-Dahlam, Botanic Gardens, Germany.

Bulbs of Eucharis, to Oxford Botanic Garden.

Orchids to G. Kern, Curitiba (Parana Brazil).

Collection of Tropical plants and cuttings to the Royal Botanic Gardens, Hong Kong.

Insectivorous plants to Professor D. C. Meyer, Hortus Botanicus, Moscow.

During the season several interesting collections of plants were donated including the following :

Seven consignments of South African Succulents collected by H. Hall, Kirstenbosch Botanic Garden.

South African Ericas, plants of Darlingtonia californica, and Dionaea muscipula from Berlin-Dahlam Botanic Garden.

Heating

The Ministry of Works Engineering Section supplied two industrial vacuum cleaners for use in the various stokeholds. These machines will prove most useful for cleaning up the dust deposit on boilers, etc., in the Stokeholds throughout the Gardens.

Owing to the shortage of labour it has been impossible to find two suitable stokers to replace the two who resigned during the year. Since late autumn night stoking of the boilers had to be discontinued, and the fires banked for the night. This practice has so far proved quite successful, but there may be difficulties when a very cold spell is experienced, especially in the departments where the boilers are rather small, such as those at the Arboretum Nursery, and Iron Room Stokehold, Melon Yard. All the automatic dampers on boilers in Palm House Stokeholds have had to be converted to hand control.

Quarantine House

The electric soil heater installed in the main propagating frame at the end of 1954 proved most successful, keeping the rooting medium at a constant temperature, thus hastening the rooting of the various cacao cuttings inserted. Throughout the spring and summer months, cuttings of the various clones of *Theobroma cacao* were propagated. It is interesting to record that cuttings of *Herrania* rooted without any difficulty. In September a further consignment of *Theobroma* Lafi No. 7 arrived from the Reparation Estates, Samoa, to be quarantined. These plants will be propagated next season when they have made adequate growth.

In early January cuttings of the Sultanina Vine were received from the Department of Agriculture, Cyprus. These cuttings produced over fifty

plants and when established in five inch pots, were grown outside the Quarantine House during the summer months. At the end of the year when the plants were dormant a consignment of fifty, and twelve *Vitis labrusca* for trial were despatched by sea to the Agricultural and Forestry Officer, St. Helena.

Various consignments of Theobroma clones were despatched during the year by sea, and air, to the following :

43 Plants to the Director of Cacao Research Wacri, Tafo, Gold Coast.

18 Plants in Wardian case to the Director of Agriculture, Suva, Fiji.

25 Plants *Herrania* and *Theobroma* spp. to the Director of Cacao Research, West African Institute, Tafo, Gold Coast.

50 Plants Cacao (Colombian collection) ditto.

49 Plants Cacao (Colombian collection) ditto.

10 Plants Cacao to the Director of Agriculture, Peradeniya, Ceylon.

In the Melon Yard a new Banana House was built in teak on the same site as the old house. The new house was enlarged and resdesigned with a corridor to provide better working facilities. The three growing on compartments which lead off the corridor are all fitted with concrete stages around the outer walk, thus leaving ample floor space to house the larger plants of Bananas as they develop. New hot water pipes were installed throughout the building. A portion of the corridor was partitioned off to be used as a propagating section. This is fitted with a hot bed built over the heating pipes, whilst the remaining portion is fitted with a potting bench, so that all work with Banana propagation and cultivation can be carried out under one roof.

New Musa plants were received from the following : Serdang Federal, Experimental Station (6 suckers).

24 Musa suckers, collected by N. W. Simmonds from Napapa No. 2 Gazalle Peninsula, New Britain. These plants when established will be propagated and grown on for distribution.

Alpine and Herbaceous Department

No new works were carried out in the department during the present year although the reconstruction of several new span frames, similar in design to those constructed two years ago and new soil bins were scheduled for building.

Houses 24, 25A and 25B in the Alpine propagating yard were repainted during the early spring and summer.

At the north end of the rock garden another portion adjoining the section which was rebuilt last year is being cleared and reconstructed with Sussex sandstone to conform with the general lay out. This work has provided an opportunity to try and eradicate *Equisetum* which has established itself on this particular section of the rock garden. This plant is very deep rooting and entails a considerable amount of labour to remove every portion of underground rootstock.

During the summer an experiment was carried out with one of the selective types of weed killer dissolved and sprayed or painted on to the

young foliage of the equisetum to try and check the spread of this very troublesome weed.

As yet it is too early to estimate the results but first observations suggest it has penetrated not more than 12–16 inches into the underground stems.

Along the walk leading from Cumberland Gate an area on the right was double trenched and thoroughly prepared by adding manure, decayed leaves and peat.

Several large specimen Rhododendrons and smaller plants of Cacciniums, *Pieris*, *Enkianthus*, Ericas, etc., were planted so providing more suitable sites for the growing of Liliums, Primulas, *Meconopsis*, Trilliums and other plants requiring shade during the summer. This and similar work done in previous years has greatly improved this portion of the gardens and has made it more interesting to visitors on entering the Cumberland Gate.

The alpine house was opened to the public on 5th February, this was earlier than most years, many of the early *Crocus*, *Cyclamen*, *Galanthus*, spp. etc. were already in flower owing to the mild conditions which had prevailed.

The collection of spring flowering bulbous plants again provided a wealth of colour during the months of March and April and early May, followed by miscellaneous collections of plants until the house closed about the middle of July.

The large specimen plants of Rhododendron leucaspis which normally makes such a useful display of bloom during the early spring in association with pans of bulbous plants were rather disappointing, this year probably the profusion of flower the previous year rather exhausted them.

The herbaceous or natural order beds provided a wealth of colour during the summer months and again attracted many visitors and parties of students. Growing conditions for the majority of plants was good, the rains during April and May gave annuals and biennials a good start particularly those which were sown direct into the beds. A few outstanding plants were *Liatris spicata*, *Coreopsis verticillata* and *Stokesia cyanea* all native of N. America. *Vicia tenuifolia* var. *stenophylla* and *Polygonum cuspidatum* var. *compactum* at one time known as *Polygonum renoutria*. The very bright red fruits of the latter looked most attractive in the late autumn. Many of the plants raised from seed sent in by R. E. Divoky in 1952, collected wild around Missouri flowered for the first time and most of them proved to be correctly named. They should prove particularly useful for the collection, having been collected from known localities.

Mention should be made of a few of the very uncommon grasses which flowered this summer, the hot season undoubtedly having suited them. *Bothriochloa caucasica* native to S.W. Asia, *Bouteloua oligostachya*, *Eragrostis trichoides*, *Andropogon provincialis* and *Andropogon furcatus* both from N. America and *Paspalum dilatatum*. Plants of *Orobanche ramosa* were successfully flowered from seed using *Nicotiana tabacum* and *Cannabis sativa* as the host plants while *Orobanche crenata* flowered on *Vicia faba*.

The Iris garden was again very colourful when in flower, and generally, the quality was good, but unfortunately the season was much curtailed through the very hot sunny weather. The plants in at least half the beds had to be lifted and divided after the flowering season as they had become congested. This gave an opportunity of bringing in a few more new varieties which had been grown on in the nursery.

The large rectangular bed at the side of the Iris garden which had been prepared the previous winter was planted in spring with at least 70 Iris species, the names having been confirmed at the Herbarium. These put on considerable growth in spite of the very dry season which followed, and became well established. This species collection now forms probably the most comprehensive in the country, as at the present time it is very difficult to find many species in gardens that are correctly named.

During the late summer the grass surrounding the Iris beds was treated with a selective weedkiller to reduce the daisies which has increased of recent years. Owing to the lateness of the season only one application was given but the results were most encouraging and another application in the spring and early summer when the daisies are growing freely should destroy the remainder and so improve the general appearance of the turf.

Through the good offices of the President of the British Iris Society several of its prominent members each gave generous collections of some of their new Iris varieties many of which were of American origin and as yet not generally found in commerce. These are being grown on in the nursery until sufficient numbers have been propagated to replace some of the more out of date varieties now grown.

It is hoped Kew will soon have one of the most modern collections of Iris varieties in the country for the benefit of the public to see and compare. Of the many plants from this department which were exhibited at the Royal Horticultural Society's Meetings *Cytisus beanii* received a First Class certificate. *Bergenia* " Ballawley ", *Crocus ancyrensis*, a charming little species from Asia Minor, *Thermopsis montana* a useful herbaceous perennial from N. America and *Solanum crispum*, Glasnevin form, each received an Award of Merit. A large pan of *Cyclamen coum* var. *album* obtained a cultural certificate. Several good spikes of Lilium species including *Lilium canadense*, *L. humboldtii*, *L. davidii* and *L.* " *Maxwell* " were exhibited at the Royal Horticultural Society's Hall with other lilies in conjunction with the co-operative display of lilies arranged on 12th July.

The collection of Hostas which were recently planted in a border adjoining the mound at Cumberland Gate gave a good display of flower this year and with their attractive foliage are most useful plants for garden decoration. Adjoining are the collection of *Hemerocallis* which although only planted last year put on a considerable amount of growth and gav eevery appearance of making up and flowering well next year.

Material of the following plants was supplied from this department for figuring in this year's volume of the Botanical Magazine Vol. CLXX. *Narcissus hedraeanthus* a very charming early flowering species best grown in pans for the Alpine house. The bulbs were originally collected by P. H. Davis in the Sierra de Cazorla, Spain. *Allium bulgaricum* a tall robust species from the Balkan Peninsula and *Campanula portenschlagiana* a very useful and free flowering plant from Dalmatia.

Although the weather generally during the early part of the year particularly January and early February was cold with hard frost at night on several occasions, most of the half hardy plants from the Mediterranean Regions, California etc. came through in the rock garden and herbaceous beds reasonably well, but it was the severe cold icy winds which followed that did considerable damage to certain plants. The summer months were particularly hot and dry which gave rise to drought conditions with very little rain during the later part of June, July, August and September. A considerable amount of time therefore had to be spent in watering both during the day and at night, using hosepipes and sprinklers. The hot summer was ideal for many plants which like dry growing conditions particularly those such as annuals, and perennials from the Mediterranean Regions, S. Africa, California and South American countries. Not only did they flower freely but produced plenty of seed, while many late autumn flowering plants which very seldom reach maturity before the early frosts, also excelled themselves owing to the warm sunny conditions continuing until late October. These conditions had the reverse effects on many rock garden plants which are propagated in June and July and they failed to make sufficient new growth after their flowering season to enable good propagating material to be obtained. Very hard woody growth resulted in many failures even in the propagation of common plants due to the very hot dry weather.

Cuttings of some species taken from the same plant in autumn from softer growth rooted freely. Of the very large numbers of seeds which are sown each year in the propagating department it was noticeable that the percentage of germination was much lower than in previous years, a factor no doubt due to the very bad harvesting and ripening of seed following the very wet and cold summer of the previous year.

Mention should be made of the very large collection of alpine and herbaceous seeds which were collected by Stainton, Sykes and Williams on an expedition to Nepal in 1954. In all 260 packets produced very good results and the percentage of germination was very high indeed.

The plants in the rock garden and herbaceous beds found the growing season good and many flowered and seeded particularly well. Those that preferred shade found the hot conditions more than they could tolerate and some became badly scorched. In all instances the flowering season was very short. A large amount of time was devoted to collecting, drying, cleaning and packeting of seed for distribution. Approximately 5,060 packets of seed were sent out from the department, a figure slightly less than last year. The seed list contained many new items which had not been available before. The quality of the seeds was good, due to the good harvesting and ripening period. Many interesting collections of seeds and plant material were received by the department during the year, including a very choice collection of North American seeds from Carl English.

Mrs. E. Cisler, San Diago, California sent a collection of seeds of Calochortus spp. and other genera of plants collected around San Diago.

Seeds of North American Lilies were sent in by C. Bullock. Valuable consignments were received from the Royal Botanic Garden, Edinburgh,

the University Botanic Garden at St. Andrews, the Royal Horticultural Society's Garden, Wisley and Uppsala Botanic Garden.

Dr. P. Davis sent seeds which he and O. Polunin had collected in Eastern Turkey, but unfortunately germination of these has not been particularly good. Plants of Ophrys tenthredinifera a very uncommon ground orchid were collected and sent in by S. G. Clark from a district near Lisbon, Portugal. Christchurch Botanic Garden sent a mixed collection of New Zealand seeds which included Linums, Gunneras Gaulthera and Celmisia spp.

G. & R. Perry, Enfield, provided us with a mixed collection of some of the rarer North American plants which included Cypripediums, *Ga ax aphylla*, *Epigaea repens* and *Trillium* spp.

A very interesting collection of Mentha spp. was given by G. A. Graham of the Herbarium who has made a study of the genus. Professor J. T. Curtis of Winconsin University provided us with a collection of North American Phlox, most of which are not represented in our collections. F. J. Skinner of Manitoba sent in a large collection of species and varieties of lily bulbs, many of which were his own raising. All arrived in beautiful condition. Many others contributed useful collections of seeds and plants to the Department.

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ROYAL BOTANIC GARDENS, KEW.

SCIENTIFIC AND ADMINISTRATIVE STAFF.

31st December, 1955.

Director

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OBITUARY

Eileen Adelaide Bruce

The Kew Herbarium suffered a grievous loss on October 6th last year when Miss Eileen Bruce, B.Sc., died after an operation for cancer in the Royal Hospital, Kingston-upon-Thames.

Miss Bruce was born on 15th February 1905, and was a lineal descendant of Robert the Bruce of Scotland, her framed family tree being a source of great interest to the many visitors to her home at Petersham.

She studied botany under Professor (now Sir Edward) Salisbury at University College, London, where she took her degree. In June 1930 she entered the herbarium as a Temporary Assistant Botanist and worked in the African section. Until the outbreak of the second world war she assisted in naming numerous collections from Tropical Africa and gained a very good working knowledge of the phanerogams of that region, describing in the Kew Bulletin and Hooker's Icones Plantarum a number of novelties belonging to various families.

In 1934 (Kew Bulletin, p. 61) Miss Bruce published a much needed revision of the giant Lobelias of East Africa. After that she took a keen interest in the difficult family *Labiatae*, and wrote papers on *Achyrospermum* (K.B. 1936 : 47), and the genus *Pycnostachys* (K.B. 1939 : 563). At the outbreak of war she was collaborating with the writer in determining the large collection of plants made by Mr. J. B. Gillett in Somaliland and Eastern Abyssinia (K.B. 1941 : 76). When this was completed she applied in May 1941 for leave to enlist in the Auxiliary Territorial Service in which she was eventually commissioned and served in the Anti-Aircraft Command.

On demobilisation in December 1945 she resumed her duties for a time in the herbarium, but a year later she resigned her post (still a temporary one) and was appointed to the National Herbarium, Pretoria, on a 5 years contract.Dr. Dyer, the Chief of the Division of Botany, writes that " she was a close friend of several of us and an inspiring colleague for the six years of her service at the National Herbarium, Pretoria. We remember her especially for the energy and enthusiasm which characterised her approach to all botanical problems. It is a matter of profound regret that Eileen Bruce was not able to complete the monograph of the genus *Kniphofia* on which she spent so much time in the Union. We are grateful, too, for the many other contributions she made to South African botany, including those recorded in the pages of our coloured illustrated journal, *Flowering Plants of Africa*." It is pleasing to learn from Dr. Dyer that her work on *Kniphofia* will be continued by Dr. Codd, who collaborated with her from the beginning of the project.

On her return from South Africa in 1952 she rejoined the African staff in the Kew herbarium and commenced work on the family *Pedaliaceae* which has been published in the Flora of Tropical East Africa. For some months before she died and between operations she bravely carried on with an account of the family *Loganiaceae* for the same publication. She published some preliminary notes in the Kew Bulletin on African *Strychnos* and *Anthocleista* and it is intended that her work will provide the basis for the account of that family for the *Flora*.

Eileen Bruce will not only be long remembered for her contributions to taxonomic botany, but also for her high social qualities and keenness for travel and many forms of sport, especially skating and tennis. She is sadly missed by her many friends at Kew, and particularly by the writer with whose family she was closely associated for many years.

J. HUTCHINSON

A Guide to British Plants.*—This is an attractive book, lavishly illustrated, and obviously edited with considerable care and attention to detail. Yet, apart from its decorative value, it somehow fails to serve any particular purpose, for it is neither popular in style, nor sufficiently scholarly to meet the demands of the serious student. At the same price, it would have been possible to produce a comprehensive, illustrated British Flora, with keys to families, genera and species ; synonymy ; descriptions ; and notes on etymology and distribution ; and it is a pity that the publishers were not persuaded to finance such a book. Certainly there is no dearth of British Floras, but there is always room for an accurate, scientific study of British plants, and, with the added attraction of good illustrations, one could safely forecast that the demand would justify the expense.

R. D. MEIKLE.

* A Handbook of British Flowering Plants, edited by A. Melderis and E. B. Bangerter, London 1955. Ward, Lock & Co. Ltd., pp. 360, 24 colour plates, 220 line diagrams ; price 63/- net.

Nomenclator Florae Italicae*.—This is an important enumeration of the indigenous, adventive and cultivated vascular plants of Italy, including Corsica, Malta, Sardinia, the Tessin, and Quarnero, with their nomenclature brought up to date. It includes numerous new binomials given to artificial and natural hybrids as well as new transferences to subspecific rank. The first part dealing with the Gymnosperms and Monocotyledons was published in 1950, the second dealing with the Dicotyledons in 1954. The work, which is based on the second edition of the " Flora Analitica d'Italia " by A. Fiori, will be of interest to botanists, horticulturists, and foresters, and to all students of the Italian flora.

H. S. MARSHALL.

* Nomenclator Florae Italicae seu Plantae Vasculares in Italia sponte nascentes, advenae, aut saepius cultae. By R. Ciferri & V. Giacomini. Ticini : C. Busca. Part 1 : 1950, Price $3. Part 2 : 1954, Price $3.50.

THE MENISPERMACEAE OF MALAYSIA : I.

L. L. Forman

Since the monograph by Diels on the *Menispermaceae* was published in *Das Pflanzenreich* (1910), a considerable amount of additional material of this family has been collected in Malaysia, making a new revision of the Malaysian species desirable. This is the first of a series of papers which will provide such a revision.

Stephania *Loureiro*

The genus *Stephania* was originally described by Loureiro in his *Flora Cochinchinensis*, with two species, *St. rotunda* Lour. and *St. longa* Lour. Although Diels quotes a specimen of *St. longa* collected by Loureiro, its whereabouts is unknown ; Merrill, according to his '*Commentary on Loureiro's Flora Cochinchinensis*' (Trans. Am. Phil. Soc. N.S. **24** (2) 157 : 1935) was unable to locate it. The original description of *St. longa* agrees well with a plant found in North Indo-China, Hainan and South China. This plant is very close to *St. japonica* (Thunb.) Miers and would perhaps be best regarded as a variety of the latter species. Any decision concerning the status of *St. longa* must await further work on the species of *Stephania* of the Asiatic mainland.

Two sheets of *St. rotunda* Lour. collected by Loureiro in Cochinchina are at the British Museum. The specimens are male but the material is extremely poor and I have found it inadequate to decide with any certainty what plant it represents. The original description of *St. rotunda* Lour. is also inadequate to recognise with certainty the plant described. Diels quotes only Loureiro's collection under *St. rotunda*, which he places close to *St. brachyandra* Diels from China and Burma, and *St. pierrei* Diels from Cambodia. *St. venosa* (Bl.) Spreng., a Malaysian species, has often in the past been referred to *St. rotunda* Lour., which is the earlier name. It appears doubtful whether the above-mentioned type-material of *St. rotunda* Lour. could be conspecific with *St. venosa* (Bl.) Spreng. I have therefore retained the latter name for the Malaysian species, following Diels and subsequent authors.

In his treatment of *Stephania*, Diels was obliged to reduce a great number of the " species " published by Miers. Even so, Diels maintained rather narrow specific limits, as he himself states in his introductory remarks, owing to the sparseness of the material at his disposal. With considerably more material available it is clear that some of the species which Diels maintained must themselves be reduced, especially in his section *Thamnothyrsa*.

The Malaysian species of *Stephania* fall into Diels' section *Thamnothyrsa* and *Eustephania*. These sections are not maintained in the following account since the distinctions between them, which were based on the position and form of the inflorescence, are unreliable as shown below.

There is little information contained in the field-notes concerning the life-forms of the species, but it appears from the examination of herbarium specimens that different life-forms are characteristic for different species. *St. japonica*, *St. psilophylla* and *St. venosa* all seem to have annual or seasonal,

herbaceous stems, while *St. corymbosa* and *St. zippeliana* have perennial, woody stems. Information is particularly lacking on the forms of the roots. In the few instances where notes have been made, the roots are said to be tuberous. It may well be that all the species have tuberous roots, which may show useful diagnostic characters.

In size, shape and primary nervation, the leaves of different species are often similar, but the reticulation is usually different in each species. These differences in reticulation are sometimes small and difficult to describe but they come to be recognised after comparing specimens belonging to different species.

The form of the inflorescence is specifically important in *Stephania* ; in all the Malaysian species its organisation is based on one or more peduncled, umbelliform cymes, which show varying degrees of condensation in different species. In *St. montana* and *St. corymbosa* the cymes are lax and bear pedicellate flowers. In *St. japonica* the flowers are sessile in sub-capitate, globose clusters. Extreme condensation of the cyme-branches occurs in *St. capitata* and *St. dictyoneura* resulting in a solid, disciform receptacle on which the flowers are very densely crowded. The composition of the inflorescence is usually either a solitary umbelliform cyme as in *St. japonica* and *St. venosa* or a racemose arrangement of umbelliform cymes as in the other species. The former composition is a character used by Diels for his section *Eustephania* and the latter for his section *Thamnothyrsa*. In *St. psilophylla*, however, a racemose arrangement of cymes is usual but solitary cymes also occur.

The inflorescences may be axillary on herbaceous, leafy stems or they may arise from woody, leafless stems. Although Diels uses this difference to distinguish between the sections *Eustephania* and *Thamnothyrsa*, the position of the inflorescence is not always constant in a species. For example, in *St. corymbosa* the male inflorescence is occasionally axillary on young, leafy stems, although it usually arises from leafless stems. (This species has therefore been placed twice in the key to male plants below). *St. capitata*, which usually has axillary inflorescences, sometimes has inflorescences borne on leafless stems. Closely allied to this species is *St. dictyoneura* which (from the solitary specimen known) has an inflorescence arising from an old, leafless stem. Diels places both *St. capitata* and *St. dictyoneura* in *Eustephania*, which is characterised by axillary inflorescences.

The very small flowers of *Stephania* show only few useful specific characters. In most species the flowers are usually trimerous, with 6 sepals and 3 petals, but tetramerous flowers with 8 sepals and 4 petals occur. In *St. psilophylla*, however, tetramery is more frequent than trimery. The number of sepals and petals is often reduced in female flowers. This is most marked in *St. venosa* where the female flower bears only one sepal and two petals, all arranged on one side of the flower. The female flowers of *St. glabra* (Roxb.) Miers, a Himalayan species, are similarly asymmetrical. The occurrence of asymmetrical as well as symmetrical female flowers in *Stephania* was not recognised by Diels, who distinguished the *Stephaniinae* (containing only *Stephania*) from the *Cissampelinae* by the supposed symmetrical female perianth of the former contrasting with the asymmetrical female perianth of the latter.

Externally, the fruits of different species are similar ; the differences are to be found internally. The remarkable ornamentation of the endocarp is usually distinct for each species. There are 2 or 4 rows of processes in the form of ridges, hooks, rods or plates running longitudinally along the dorsal surface of the endocarp. Each species has a characteristic range in the number and form of these processes.

Most of the specimens examined for this revision have been kindly lent by a number of institutions. I wish to express my gratitude to the Directors and Curators of the following herbaria for so generously sending material on loan :—Arnold Arboretum ; Botanisches Museum, Berlin ; Dept. of Botany, British Museum ; Herbarium Bogoriense ; Istituto Botanico, Florence ; Conservatoire et Jardin Botaniques, Geneva ; Gray Herbarium ; Rijksherbarium, Leiden ; Laboratoire du Phanérogamie du Muséum National d'Histoire Naturelle, Paris ; Institute of Systematic Botany, University of Uppsala ; Botanic Gardens, Singapore ; U.S. National Herbarium, Washington.

In addition I am indebted to the staffs of the herbaria at the British Museum and Paris, and to Prof. R. E. Pichi-Sermolli at Florence for their kind assistance during my visits to these institutions.

My thanks are due also to Mr. A. A. Bullock for his useful comments and to Mr. N. Y. Sandwith for correcting the Latin descriptions.

In the lists of specimens after each species, the abbreviations for the herbaria are those used in Index Herbariorum, Pt. I. The sex of the specimen is given whenever possible, and if it is female the presence of flowers and fruits is indicated by ' ♀ fl.' and ' ♀ fr.' ; ' ? fl.' indicates that the specimen is in young bud and therefore its sex is uncertain ; ' st. ' means sterile. Specimens referred with some doubt to a species are quoted under that species in square brackets.

Stephania *Lour.*, Fl. Cochinch. **2,** 608 (1790), et (ed. Willd.) **2,** 746 (1793) ; Spreng., Syst. Veg. **4** (2) 316 (1827) ; Hook f. et Thoms., Fl. Ind. **1,** 195 (1855) ; Benth. et Hook. f., Gen. Pl. **1,** 37 (1862) ; Miers, Contrib. Bot. **3,** 210 (1871) ; Baill., Hist. Pl. **3,** 42 (1872) ; Hook. f., Fl. Brit. Ind. **1,** 102 (1872) ; Diels in Engl. Pflanzenr. Menisp. 259 (1910) ; Ridl., Fl. Mal. Pen. **1,** 112 (1922) ; Backer, Bekn. Fl. Java (em. ed.*) **3,** fam. 34, 7 (1941).

Clypea Bl., Bijdr. 26 (1825) ; Miers, Contrib. Bot. **3,** 205 (1871).

Climbers; woody, suffruticose or rarely herbaceous, dioecious. *Stems* woody or herbaceous, longitudinally grooved. *Roots* sometimes (? always) tuberous. *Leaves* petiolate, petiole usually swollen at both ends ; lamina peltate, usually ± ovate to suborbicular, palmately nerved, glabrous or bearing multicellular hairs. *Inflorescence* axillary or arising from old, leafless stems, usually composed of one to many peduncled, umbelliform cymes, which are sometimes condensed to disciform capitula. *Male flowers* symmetrical : sepals free, imbricate, 6 or 8 in 2 equal or unequal series, usually ± obovate ; petals free, 3 or 4, usually ± broadly obovate with margin involute at both sides ; stamens 2–6, connate in a peltate synandrium with anthers dehiscing transversely. *Female flowers*

* Emergency edition (mimeographed) published during war-time in Leiden.

symmetrical or asymmetrical : sepals 1–8, petals 2–4, both similar to those of male flowers ; carpel 1, style very short or absent, stigma shortly lobed or divaricately laciniate. *Drupes* obovoid with style-scar near base ; exocarp glabrous ; mesocarp fleshy ; endocarp bony and horseshoe-shaped, dorsally bearing 2 or 4 longitudinal rows of tubercles or transverse ridges, condyle often perforate. *Seed* curved. *Embryo* with incumbent cotyledons ± equalling the radicle.

Artificial Key to Male Plants

1. Inflorescences composed of peduncled, disciform capitula :
   2. Lamina with a lax and rather obscure reticulation ; apex often caudate ; petiole usually inserted more than 10 mm. from the base 1. *capitata*

   [2* Lamina with a close and very prominent reticulation ; apex shortly acuminate ; petiole inserted 3–7 mm. from the base 2. *dictyoneura*]

1. Inflorescences composed of umbelliform cymes :
   3. Inflorescences axillary on leafy stems :
      4. Inflorescences more than 1·5 cm. long :
         5. Flowers sessile or subsessile in dense, subcapitate clusters 3. *japonica*

         5. Flowers pedicellate in laxer, corymbose clusters :
            6. Lamina submembranous, often slightly lobed ; reticulation scarcely raised, usually drying dark reddish-brown ; inflorescence usually a solitary umbelliform cyme . . 4. *venosa*

            6. Leaves chartaceous to coriaceous, entire ; reticulation distinctly raised (at least on lower surface), not drying reddish-brown ; inflorescence usually composed of several umbelliform cymes racemosely arranged :
               7. Lamina with rather lax reticulation, often obscure on upper surface ; sepals 6, the 3 outer narrower than the 3 inner ; petals 3, papillose-puberulous within 5. *corymbosa*

               7. Lamina with very fine, raised reticulation clearly visible on both surfaces ; sepals (6 or) 8, ± equal ; petals (3 or) 4, glabrous . . . . . 6. *psilophylla*

      4. Inflorescences less than 1·5 cm. long ; flowers pedicellate in dense clusters ; lamina chartaceous, entire, with reticulation fine and prominent below ; sepals 6, ± equal, petals 3 . 7. *reticulata*

   3. Inflorescences arising from old, woody, leafless stems :
      8. Inflorescences very large, composed of racemosely arranged umbelliform cymes mostly over 20 cm. long ; lamina usually more than 16 cm. long and 10 cm. broad . . 8. *zippeliana*

* Although the male of *St. dictyoneura* is not yet known, this species undoubtedly belongs next to *St. capitata* in this key. The above vegetative differences should distinguish the males of the two species as well as the females, since the leaves of *Stephania* do not differ appreciably between male and female plants.

8. Inflorescences and laminae smaller :
   9. Inflorescences less than 15 cm. long ; outer sepals narrower than inner ones ; petals papillose-puberulous within 5. *corymbosa*
   9. Inflorescences 15–50 cm. long with slender branches ; sepals ± equal ; petals glabrous :
      10. Umbelliform cymes 2–5 cm. long with primary rays less than 1 cm. long ; lamina ovate to ovate-triangular, apex obtusely mucronulate . . . . . 9. *moluccana*
      10. Umbelliform cymes 4–14 cm. long with primary rays mostly more than 1 cm. long ; lamina triangular, apex very acute 10. *montana*

Artificial Key to Female Plants

N.B. The female of *St. moluccana* is unknown and is not placed in this key.

The measurements of fruits apply only to *dried* fruits.

1. Inflorescences composed of peduncled, disciform capitula :
   2. Lamina with a lax and rather obscure reticulation ; apex often caudate ; petiole usually inserted more than 10 mm. from the base 1. *capitata*
   2. Lamina with a close and very prominent reticulation ; apex shortly acuminate ; petiole inserted 3–7 mm. from the base 2. *dictyoneura*
1. Inflorescences composed of umbelliform cymes :
   3. Inflorescences axillary on leafy stems :
      4. Lamina submembranous, often slightly lobed ; flowers asymmetrical, sepal 1, petals 2 . . . . . 4. *venosa*
      4. Lamina chartaceous, entire ; flowers symmetrical, sepals and petals both 3 or more :
         5. Fruits all (or nearly all) sessile or subsessile . . 3. *japonica*
         5. Fruits with pedicels over 2 mm. long :
            6. Fruits 7–9 mm. long, 7—8 mm. broad ; endocarp bearing 4 rows of 9–11 processes irregularly divided at their tips, those of the 2 outer rows ± lamelliform and hooked on their outer margins . . . . . 7. *reticulata*
            6. Fruits 4–5 mm. long, 3·5–4 mm. broad ; endocarp bearing 2 or 4 rows of 7–9 transverse ridges or papilliform tubercles 6. *psilophylla*
   3. Inflorescences arising from old, woody, leafless stems :
      7. Lamina triangular ; fruits 5–6 mm. long, 4–5 mm. broad with pedicels 5–10 mm. long . . . . . 10. *montana*
      7. Lamina triangular-ovate to suborbicular ; fruits 6–10 mm. long, 6–8 mm. broad, sessile or with pedicels up to 6 mm. long :

8. Endocarps bearing prominent, hooked tubercles (rarely rod-like and not hooked) ; lamina with rather lax reticulation, often obscure on upper surface . . . . . 5. *corymbosa*

8. Endocarps bearing ridges or short, papilliform tubercles ; lamina usually with a very fine reticulation visible on both surfaces . . . . . 8. *zippeliana*

1. **Stephania capitata** (*Bl.*) *Spreng.*, Syst. Veg. **4** (2) 316 (1827) ; Walp., Rep. **1,** 96 (1842) ; Miq., Ann. Mus. Lugd. Bat. **4,** 86 (1868) ; Scheffer in Nat. Tijdschr. Ned. Ind. **32,** 401, tab. 13 (1873) ; Beccari, Malesia **1,** 156 (1877) ; Boerlage, Cat. Pl. Phan. Hort. Bot. Bog. **1,** 42 (1899) ; Diels in Engl. Pflanzenr. Menisp. 281 (1910) ; Backer, Schoolfl. Java, 46 (1911) ; Koorders, Exk. Fl. Java, **2,** 336 (1912) ; Merr., Enum. Born. Pl. 250 (1921) ; Ridley, Fl. Mal. Pen. **1,** 113 (1922) ; Norman in Journ. Bot. **62,** Suppl. 5 (1924) ; Burkill et Henderson in Gard. Bull. Str. Settl. **3,** 344 (1925) ; Henderson in Gard. Bull. Str. Settl. **4,** 220 (1928) ; Backer, Bekn. Fl. Java (em. ed.) **3,** fam. 34, 18 (1941) ; Masamune, Enum. Phan. Born. 276 (1942) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 141 (1944) ; Heyne, Nutt. Pl. Ned. Ind., ed. 3, **1,** 617 (1950).

Clypea capitata Bl., Bijdr. 28 (1825). Type : Java, Mt. Salak, *Blume s.n.* (holo. L !).

Clypea acuminatissima Bl., Bijdr. 28 (1825) ; Miers, Contrib. Bot. **3,** 206 (1871). Type : Java, Burangrang, *Blume* 1417 (holo. L !).

Stephania acuminatissima (Bl.) Spreng., Syst. **4,** Cur. Post. 316 (1827) (*sphalm* ' *acuminata* ') ; Walp., Rep. **1,** 96 (1842).

Stephania obvia Miers [in Ann. Mag. Nat. Hist. III. **18,** 15 (1866) *nom. nud.*], Contrib. Bot. **3,** 226 (1871). Type : Java, *Horsfield* 684 (holo. K !).

Stephania longifolia Becc., Malesia **1,** 156 (1877). Type : Borneo, Sarawak, *Beccari* P.B. 1054 (holo. FI !).

Stephania truncata Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 142 (1944). [Type not seen].

Climber up to about 15 m. high, entirely glabrous. *Stem* sometimes woody. *Roots* tuberous, fusiform. *Leaves* with petioles (2–) 3–5 (–10) cm. long ; lamina lanceolate to broadly ovate, 6–17 cm. long, 2·5–10·5 (–14) cm. broad, apex acuminate or caudate, acumen acutely (sometimes obtusely) mucronulate, base broadly rounded to slightly emarginate ; palmately 8–10-nerved ; reticulation usually rather lax and not prominent, ± equally visible on both surfaces ; chartaceous. *Male inflorescences* usually axillary (sometimes borne on leafless parts of the stem) composed of several, peduncled, disciform capitula arising in the axils of persistent, triangular to linear bracts 1–2 mm. long along an axis usually less than 1 cm. long ; capitula 3–6 (–8) mm. in diameter on filiform peduncles up to 20 (–35) mm. long. *Male flowers* sessile, yellow to green, very densely crowded on a disciform receptacle : sepals 2–3, ± oblong-elliptic, 0·5–0·75 mm. long ; petals 2–3, ± obovate, 0·25 mm. long ; synandrium 1 mm. long, exserted. *Female inflorescence* as in male

but axis and peduncles thicker, especially at fruiting, also peduncles longer, up to 55 mm. *Female flowers* with very short pedicels, about 1 mm. long, sometimes partly united : sepals and petals as in male. Ovary ± ovoid or ellipsoid, about 1 mm. long. Stigma laciniately and divaricately 3–8-lobed. *Fruit* red, with slender pedicels 5–10 mm. long, obovate (to suborbicular) in outline, sometimes attenuated towards the base (6–) 8–11 mm. long, (5–) 6–8 mm. broad. Endocarp perforate, dorsally bearing 4 longitudinal rows of 10–14 capitate tubercles, divaricately lobed at their apices (rarely the tubercles scarcely developed).

Distribution. Sumatra, Malaya, Java, Bali, N. and W. Borneo (see Fig. 1).

Habitat. Scattered on plains and mountains and in rain forest from sea-level to 2000 m. altitude.

Fig. 1. Distribution of *St. capitata* (Bl.) Spreng. (●) and *St. dictyoneura* Diels (+).

Uses. A substitute for *Cyclea barbata* (Wall.) Miers in the preparation of ' tjintjau ', a native preparation used for abdominal diseases and fevers (? leaves used).

Vernacular Names. *Java* : akar talur, arenj geureung, areuj tjamtjau minjak, daun tjamtjau, gorong, sumpat kendi, tjamtjau, tjintaun.

Notes. The axis of the inflorescence is usually less than 1 cm. long but on *Lörzing* 5509 from Sumatra the axes are up to 14 cm. long and arise from an old, leafless stem.

Collections examined :—

Sumatra.—Atjeh, Bur Ni Bias ; Aug. (♀ fr.), *van Steenis* 6160 (BO).—W. Coast : Mt. Singgalan ; June (♀ fr.), *Beccari* P.S. 9 (BM, K, FI). Mt. Talamau ; May (st.), *Bünnemeijer* 632 (BO). Indrapura ; *Korthals s.n.* (L).—E. Coast : Lau Debuk-Debuk ; Oct. (? fl.), *Doct. van Leeuwen* 12810 (BO, L). Sibolangit ; Feb. (? fl.) *Lörzing* 4683 (BO). *ibidem*, Feb. (♂), *Lörzing* 5509 and 5510 (BO, L). *ibidem*, July (♀ fr.), *Lörzing* 5789 (BO). *ibidem*, May (♂), *Lörzing* 8394 (BO). *ibidem*, Nov. (♀ fr.), *Lörzing* 8631 (BO).—Benkulen : Talangtotong forest between Sepathu and Simpang ; Oct. (♀ fr.), *van Steenis* 3380 (BO).—Lampong Distr. : Penanggrengan forest, Lampongs ; (♀ fr.), *Forbes* 1678 *parte* (BM). Napallitjin ; Oct. (♀ fr.), *Forbes* 3115a *parte* (K).

Malaya.—Perak : Maxwell's Hill ; Sept. (? fl.), *Curtis* 1995 (SING). Larut ; Feb. (♀ fl.), *King's coll.* 3917 (K). Larut ; Dec. (♀ fr.), *King's coll.* 5239 (BO, K, P, US). Larut ; Apr. (♀ fr.), *King's coll.* 5992 (K). July (♂), *King's coll.* 7889 (P). Larut Hill near Maxwell's Hill ; (♂), *Ridley s.n.* 1891 (SING). Taiping ; Aug. (♂), *Ridley s.n.* 1909 (SING). Maxwell's Hill ; Sept. (♂), *Sinclair and Kiah* 38756 (SING). Kuala Wok ; June (st.), *Wray* 854 (SING). Oct. (♀ fr.), *Wray* 3276 (SING).—Selangor : Rawang ; (♂), *Goodenough s.n.* (SING). Semenyih ; July (♂), *Hume* 8015 and 8222 (SING).—Negri Sembilan : Mt. Angsi ; Nov. (♀ fr.), *Nur* 11756 (SING).—Johore : Sungei Tebrau ; Mar. (♀ fr.), *Ridley s.n.* 1908 (SING). Genuang ; Mar. (♂), *Ridley s.n.* 1915 (K).—Penang : Penara Bukit ; Oct. (♂), *Curtis* 1260 (K, SING).—Singapore : Sungei Jurong ; (♀ fr.), *Goodenough s.n.* 1892 (SING). Jan. (? fl.), *King's coll.* 1189 (P). Seletar; Mar. and Apr. (♀ fr.), *Ridley s.n.* 1889 (SING). Choa Chu Kang ; (♀ fr.), *Ridley s.n.* 1889 and 1905 (SING). Bukit Mandai ; *Ridley s.n.* 1892 and 1894 (SING).

Java. *Horsfield* 684 (Menisp. 8) (K). Santjang ; June (♂), *Sheffer s.n.* 1872 (BO).—W. Java : Mt. Tjerimai, Oct. (♂), *Backer* 4800 (BO). *ibidem* ; Oct. (♀ fr.), *Backer* 4909 (BO). Pasir Batu Lawang ; Aug. (♀ fr.), *Backer* 9048 (BO). Mt. Sembung ; Mar. (♀ fr.), *Backer* 12282 (BO). Mt. Beser near Tjidadap ; June (st.), *Backer* 22609 (BO). *ibidem* ; June (♀ fr.) ; *Backer* 22639 (BO). Tjididap ; Sept. (♂), *Backer* 22893 (BO). Mt. Salak ; Dec. (♀ fr.), *Backer* 26337 (BO, K, L). Indragiri ; Aug. (♀ fl., fr.), *Bakh. v. d. Brink* 204 (BO). *ibidem* ; July (♂), *Bakh. v. d. Brink* 374 (BO). Tjidadap ; Apr. (♂), *Bakh. v. d. Brink* 2140 (BO). Burangrang ; Aug. (st.), *Blume* 1417 (L). Salak (♀ fr.), *Blume s.n.* (L). Tjibodas ; Dec. (♀ fr.), *Bruggeman* 785 (BO). *ibidem* ; Jan. (st.), *Hallier* 773a-b (BO). Mt. Salak ; Sept. (♀ fr.), *Koorders* 24267 (BO, L). Tjibodas; Oct. (♀ fl., fr.), *Koorders* 26037 (BO, L). *ibidem* ; Oct. (♂), *Koorders* 26041 (BO, L). Tjigenteng ; Jan. (♀ fr.), *Koorders* 26292 (BO). Depok ; Aug. (♀ fr.), *Koorders* 31202 (BO). Tjibodas ; Oct. (♀ fr.), *Koorders* 31633 (BO). Bogor ; Nov. (♀ fr.), *Lam* 3783 (BO, L). Dago ; Oct. (♀ fr.), *Popta* 1216 (L). Tjinjiruan ; Apr. (♀ fr.), *Smith, J. J.* 486 (BO). Bandung ; Sept. (? fl.), *Smith J. J.* 577 (BO, L). Kota Batu ; (♀ fr.), *Soegandiredjo* 179 (BO). Tegal Pandjang ; May (st.), *van Steenis* 4890 (BO). Depok ; Mar. (♂), *van Steenis* 5106 (BO). Mt. Limo ; Sept. (st.), *van Steenis* 6855 (BO). Garuh ; Aug. (st.), *van Vuuran s.n.* 1915 (BO). Mt. Tugu ; (♂), *Winckel* 3 (BO, L). Tjidadap ; Jan. (♀ fr.), *Winckel* 141 (BO, L).—C. Java : Mt. Muriah ; Sept. (♀ fl.), *Doct. van Leeuwen* 793 (BO, L). Dieng Plateau, (? fl.), *Meer Mohr s.n.* 1917 (BO).—E. Java : Djember ; Nov. (st.), *Koorders* 20722 (BO). Turen, Tangkil ; June (st.), *Koorders* 23581 (BO, L). Situbondo, Pantjur-Idjen ; Aug. (♂), *Koorders* 28612 (BO, L). Rogodjampi ; Sept. (♀ fr.), *Koorders* 29016 *parte* (BO).—Prinsen Isl. ; Sept. (♀ fr.), *Borssum Waalkes* 647 (L).—Nusa Kambangan, L. Buntu ; June (♀ fr.), *Amdjah* 185 (BO, L).

Lesser Sunda Isls. : Bali, between Beleleng and Denpasar ; Aug. (♀ fr.), *Yamamoto* 82 (BO).

Borneo.—Sarawak : (♀ fr.), *Beccari* P.B. 1054 (FI). Saribas Paku ; Apr. (♂), *Haviland and Hose* 3154 (K). Matang ; July (♀ fl.), *Ridley* 11769 (K, SING).—W. Borneo : Mt. Liang Gagang, (♀ fr.), *Hallier* 3021 (BO, L).—N. Borneo : Mt. Kinabalu, Tenompok ; (♀ fr.), *Clemens* 28714 *parte* (A, BM, K). Mt. Kinabalu, Penibukan ; (st.), *Clemens* 31360 (BM).

2. **Stephania dictyoneura** *Diels* in Engl. Pflanzenr. Menisp. 281 (1910) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 141 (1944). Type : Sumatra West Coast, Mt. Singgalan, *Beccari* P.S. 8 (holo. FI !, isos. K ! L !).

Climber, entirely glabrous. *Stem* herbaceous or woody. *Leaves* with petioles 2·5–4 cm. long ; petiole inserted 3–7 mm. from base of lamina ; lamina deltoid, 5–6·5 cm. long and broad, apex shortly acuminate, acumen obtusely mucronulate, base truncate or slightly emarginate ; palmately 9–10-nerved, reticulation prominent and close, especially on the lower surface ; chartaceous. *Male inflorescences and flowers* unknown. *Female inflorescence* borne on older, leafless stem, composed of several, peduncled, disciform capitula, arising in the axils of subulate bracts 1–2 mm. long, along an axis about 5 cm. long ; capitula about 7 mm. in diameter on peduncles about 5 cm. long. *Female flowers* very densely crowded on a disciform receptacle : sepals and petals ± obovate, about 0·5–0·75 mm. long ; ovary ellipsoidal about 0·75 mm. long with a very short style divaricately ± 3-lobed at the apex. *Fruits* unknown.

Distribution. Sumatra, Mt. Singgalan (see Fig. 1).

Habitat. According to Diels in *Das Pflanzenreich*, Beccari's specimen was collected at 1600 m. altitude.

Notes. This species is known only from the type-collection made by Beccari in Sumatra. The specimens at Kew and Leiden are sterile but on one sheet of *Beccari* P.S.8 at Florence there is an incomplete female inflorescence which bears a single capitulum. This inflorescence arises from a leafless, slightly woody stem 3–4 mm. in diameter. This species is closely related to *St. capitata* (Bl.) Spreng, which also has inflorescences composed of dense capitula. *St. dictyoneura* Diels is easily distinguished from *St. capitata* by its deltoid leaves, which show a prominent and close reticulation, and by the insertion of the petiole which is 3–7 mm. from the base of the lamina. The only female inflorescence which is known for *St. dictyoneura* differs from those of *St. capitata* by its much longer axis.

Collection examined :—

W. Sumatra. Mt. Singgalan ; June–July (♀ fl.), *Beccari* P.S. 8 (FI, K, L).

3. **Stephania japonica** (*Thunb.*) *Miers* in Ann. Mag. Nat. Hist. III. **18,** 14 (1866) *pro parte, excl. Cuming* 1160, et Contrib. Bot. **3,** 213 (1871) *pro parte, excl. Cuming* 1160 ; Kuntze, Rev. Gen. **1,** 9 (1891) ; Diels in Engl. Pflanzenr. Menisp. 277 (1910), et in Elmer, Leafl. Philip. Bot. **4,** 1166 (1911) ; Gamble, Fl. Madras **1,** 29 (1915) ; Juel, Pl. Thunb. 245 (1918) ; Brown, Min. Prod. Philip. For. **3,** 186 (1921) ; Gagnep., Suppl. Fl. Gén. Ind.-Ch. **1,** 134 (1938) ; Yamamoto in Taiwania **1,** 46 (1948).

Menispermum japonicum Thunb., Fl. Jap. 193 (1784) ; Lam., Encycl. Méth. Bot. **4,** 96 (1797) ; Willd., Sp. Pl. **4,** 827 (1806). Type : Japan, *Thunberg s.n.* " ♀ " (lecto. UPS !).

Cissampelos hernandiifolia [' *hernandifolia* '] Willd., Sp. Pl. **4,** 861 (1806) ; DC., Syst. **1,** 533 (1817), et Prodr. **1,** 100 (1824) ; Roxb., Fl. Ind. (ed. 2) **3,** 842 (1832). Type : " India orientali ", *Roxburgh s.n.* (holo. B [photo !]).

Cocculus japonicus (Thunb.) DC., Syst. **1,** 516 (1817), et Prodr. **1,** 96 (1824).

Cocculus roxburghianus DC., *l.c.* 516 et *l.c.* 96. Type : " Ind. Orient.", *Roxburgh s.n.* (holo. G !).

Cocculus forsteri DC., *l.c.* 517 et *l.c.* 96 ; Guillemin in Ann. Sci. Nat. II. **7,** 370 (1837). [Type not seen].

Cocculus japonicus (Thunb.) DC. var. *timoriensis* DC., Prodr. **1,** 96 (1824). [Type of var. not seen].

Clypea discolor Bl., Bijdr. 26 (1825). Type : Java, *Blume* 727 (holo. L !).

Stephania discolor (Bl.) Spreng., Syst. Veg. **4** (2) 316 (1827) ; Walp., Rep. **1,** 96 (1842) ; Hassk., Pl. Jav. Rar. 168 (1848) ; Miers, Contrib. Bot. **3,** 224 (1871) ; Backer, Fl. Bat. **1,** 39 (1907), et Voorl. Schoolfl. 9 (1908) ; Ridl in Journ. Mal. Br. Roy. As. Soc. **87,** 52 (1923).

[*Cocculus finlaysoniana* Wall., Cat. no. 4974 (1831–2) *nom. nud.* (Spm. in K !).]

Cissampelos hexandra Roxb., Fl. Ind. (ed. 2) **3,** 841 (1832), (Icon. Roxb. no. 1001 at Kew). Type : " East India ", *Roxburgh s.n.* (syns. BM !, K !).

Clypea glaucescens Decaisne in Nouv. Ann. Mus. Paris **3,** 423, t. 18 (1834) ; Spanoghe in Linnaea **15,** 164 (1841). Types : Timor ; *Riedlé* 497 (syn. P !) and *Riedlé s.n.* (syns. P !, ? L !).

Clypea hernandiifolia (Willd.) Wight et Arn., Prodr. **1,** 14 (1834) ; Wight, Icon. **3** (3) t. 939 (1845).

Stephania glaucescens (Decne.) Walp., Rep. **1,** 96 (1842); Miers, Contrib. Bot. **3,** 214 (1871).

Stephania hernandiifolia (Willd.) Walp., Rep. **1,** 96 (1842) ; Hook. f. et Thoms., Fl. Ind. **1,** 196 (1855) *pro parte* ; Miq., Fl. Ind. Bat. **1** (2) 83 (1858) ; Benth., Fl. Austral. **1,** 57 (1863) *pro parte* ; Kurz in Nat. Tijdschr. Ned. Ind. **27,** 177 (1864) ; Miers, Contrib. Bot. **3,** 222 (1871) ; Hook. f. Fl. Brit. Ind. **1,** 103 (1872) ; Scheffer in Nat. Tijdschr. Ned. Ind. **32,** 401 (1873) ; Kurz in Journ. As. Soc. Beng. **43** (2) 61 (1874) ; Beccari, Malesia **1,** 154 (1877) ; King in Journ. As. Soc. Beng. **58,** 385 (1889) ; Warb. in Engl. Bot. Jahr. **13,** 314 (1891) ; Ridl. in Trans. Linn. Soc. II. **3,** 274 (1893) ; Bailey in Austral. As. Adv. Sci. **7,** 429 (1898) ; Schumann in Notizbl. Berl.-Dahl. **2,** 116 (1898) ; Bailey, Queensl. Fl. **1,** 33 (1899) *pro parte* ; Schum. et Laut. Fl. Deutsch. Schutz. Süd. 311 (1901) ; Brandis, Ind. Trees 23 (1906) ; Gagnep. in Lecomte, Fl. Gén. Ind.-Ch. **1,** 147 (1908) ; Diels in Engl. Pflanzenr. Menisp. 279 (1910) ; Backer, Schoolfl. Java 46 (1911) ; Koord., Exk., Fl. Java **2,** 335 (1912) ; Ewart et Davies, Fl. N. Terr. Austral. 112 (1917) *pro parte* ; Merr. Enum. Born. Pl. 250 (1921) ; Ridl., Fl. Mal. Pen. **1,** 113 (1922); Burkill et Hend. in Gard. Bull. Str. Settl. **3,** 344 (1925) ; Craib, Fl. Siam. Enum. **1,** 69 (1925) ; Backer, Ondkruid. Java Suikerr. afl. **2,** 247 (1930), t. 258 (1936) ; Ewart, Fl. Victoria, 517 (1930) ; Burkill, Dict. Econ. Prod. Mal. Pen. 2076 (1935) ; Kanjilal et Das, Fl. Assam. **1** (1) 51 (1935) ; Merr. in Journ. Arn. Arb. **19,** 340 (1938) ; Backer, Bekn. Fl. Java (em. ed.) **3,** fam. 34, 18 (1941) ; Masamune, Enum. Phan. Born. 276 (1942) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 138 (1944), et in Taiwania **1,** 48 (1948) ; Heyne, Nutt. Pl. Ned. Ind. (ed. 3) **1,** 617 (1950).

[*Cissampelos australis* Cunn. ex Miers in Ann. Mag. Nat. Hist. II. **7,** 40 (1851) *nom. nud.*].

Stephania forsteri (DC.) A. Gray, Bot. U.S. Expl. Exped. **1,** 36 (1854) ; Diels in Engl. Pflanzenr. Menisp. 278 (1910), et in Nova Guin. **8,** 283 (1910) ; Backer, Schoolfl. Java, 46 (1911) ; Koorders Exk. Fl. Java **2,** 336 (1912) ; Christopherson in Bern. P. Bish. Mus. Bull. **128,** 85 (1935) ; Brown in *l.c.* **130,** 79 (1935) ; Backer, Bekn. Fl. Java (em. ed.) **3,** fam. 34, 18 (1941) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 140 (1944) ; Guillaumin, Fl. An. Syn. Nouv.-Caled. 119 (1948).

Stephania gaudichaudii A. Gray, Bot. U.S. Expl. Exped. **1,** 37 (1854) ; Miers, Contrib. Bot. **3,** 225 (1871). Type : N.S. Wales, Sydney, *U.S. Expl. Exped. s.n.* (holo. US !, iso. BM !).

Clypea forsteri (DC.) Miers in Ann. Mag. Nat. Hist. III. **17,** 270 (1866), et Contrib. Bot. **3,** 208, t. 118 (1871).

Stephania roxburghiana (DC.) Miers *l.c.* III. **18,** 14 (1866), et *l.c.* 216.

Stephania hernandiifolia (Willd.) Walp. *var.* " *genuina seu glabra* " Miq., Ann. Mus. Lugd. Bat. **4,** 85 (1868), et *var. discolor* (Bl.) Miq. *l.c.*

Clypea consummata Miers [in Ann. Mag. Nat. Hist. III. **17,** 270 (1866) *nom. nud.*], Contrib. Bot. **3,** 209 (1871). Type : Japan, Nagasaki, *Oldham* 760 (holo. K !, iso. FI !).

Clypea effusa Miers [*l.c.* 270 *nom. nud.*], *l.c.* 207. Type : India, Coorg, *Hook. f. et Thoms. s.n.* (holo. K !).

Clypea oxyphylla Miers [*l.c.* 270 *nom. nud.*], *l.c.* 206. Type : Nepal, *Wallich s.n.* (holo. G !).

Clypea subovata Miers [*l.c.* 270 *nom. nud.*], *l.c.* 209. Type : Japan, Rino Ohosimo, *Oldham* 346 (holo. K !).

Stephania appendiculata Miers [*l.c.* III. **18,** 15 (1866) *nom. nud.*], *l.c.* 221. Type : Madras, Nilgiris, *Gardner s.n.* (syns. BM ! K !).

Stephania australis (Cunn. ex Miers) A. Gray [Bot. U.S. Expl. Exped. **1,** 38 (1854) *nom. nud.*] ex Miers, Contrib. Bot. **3,** 229 (1871). Type : Australia, N.S. Wales, Parramatta, *Cunningham s.n.* (holo. K !).

Stephania concinna Miers [in. Ann. Mag. Nat. Hist. III. **18,** 15 (1866) *nom. nud.*] et Contrib. Bot. **3,** 226 (1871). Type : Java, *Horsfield* s.n. (holo. K !, iso. BM !).

Stephania exigua Miers [*l.c.* 16 *nom. nud.*] et *l.c.* 228. Type : Philippines, Luzon, *Cuming* 1533 (syns. BM ! K !).

Stephania hypoglauca Miers [*l.c.* 15 *nom. nud.*] et *l.c.* 227. Type : Madras, Nilgiris, *Wallich* 4982Aa (holo. K !).

Stephania intertexta Miers [*l.c.* 15 *nom. nud.*] et *l.c.* 222. Types : Ceylon ; *Mrs. Gen. Walker s.n.* (syn. K !), *Gardner* 32 (syn. K !), *Thwaites* 2757 (syn. BM !).

Stephania latifolia Miers [*l.c.* 15 *nom. nud.*] et *l.c.* 224. Type : Assam. Khasya Hills *Hook. f. et Thoms. s.n.* (holo. K !).

? *Stephania pallidula* Miers [*l.c.* 16 *nom. nud.*] et *l.c.* 229. Type : Australia, Fitzroy and Stokes Range, *F. v. Mueller, s.n.* (holo. K !— sterile).

? *Stephania japonica* (Thunb.) Miers *var. puberula* Kuntze, Rev. Gen. **1,** 10 (1891).

Stephania discolor (Bl.) Spreng. var. *hernandiifolia* (Willd.) Boerl., Cat. Pl. Phan. Hort. Bot. Bog. **1,** 42 (1899).

Stephania hallieri Diels in Engl. Pflanzenr. Menisp. 281 (1910) ; Merr., Enum. Born. Pl. 250 (1921) ; Masamune, Enum. Phan. Born. 276 (1942) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 140 (1944). Type : Borneo, Mt. Kenepai, *Hallier* 1832 (syns. BO !, L !).

[*Menispermum glabrum* (non Burm. f.)—Houtuyn, Nat. Hist. **11,** 377, t. 75, f. 2 (1779) ; Panzer, Pflanzensyst. **10,** 298, t. 75, f. 2 (1783)].

Slender climber 2–10 m. long. *Root* tuberous. *Stem* herbaceous, glabrous or crispately puberulous. *Leaves* with glabrous or crispately puberu-

lous petioles 3–12 cm. long ; lamina broadly triangular-ovate to ovate (4–) 6–12 (–17) cm. long, 4–10 (–14) cm. broad, apex usually ± acuminate with an obtusely mucronulate acumen but sometimes very acute or very obtuse, base broadly rounded to slightly emarginate ; palmately 9–11-nerved ; fine reticulation usually visible on both surfaces, upper surface glabrous ; lower surface glabrous or crispately puberulous and also sometimes glaucous (due to very minute whitish papillae) ; ± chartaceous. *Male inflorescence* an axillary compound umbelliform cyme with peduncle 1·5–6 (–8) cm. long, bearing flowers in dense, subcapitate, cymose clusters, glabrous or puberulous, usually solitary, but occasionally paired or a few borne on an axillary shoot. *Male flowers* green, white or yellow, sessile or subsessile : sepals 6 or 8, glabrous or puberulous outside, oblanceolate to spathulate, 0·75–1·25 mm. long, 0·25–0·75 mm. broad ; petals 3 or 4, glabrous, ± obdeltoid to suborbicular, 0·5–1·0 mm. long, 0·25–0·75 mm. broad ; synandrium 0·5–1 mm. long, exsert or not. *Female inflorescence* similar to male. *Female flowers* with petals and sepals as in male but number of sepals often reduced ; ovary ± ovoid, 0·75–1·0 mm. long ; stigma laciniately and divaricately 3–5-lobed. *Fruit* red, sessile or subsessile (occasionally with pedicels up to 2 mm. long) ± obovate to suborbicular in outline, 4–8 mm. long 4–6 mm. broad. Endocarp usually perforate, dorsally bearing 2 longitudinal rows of about 8–10 transverse ridges which are often ± 2-lobed thus forming 4 distinct longitudinal rows of tubercles, ± papilliform in the 2 inner rows and broader and often hooked in the 2 outer rows ; surface between and around tubercles usually smooth, rarely rough.

Distribution. Throughout Malaysia (see Fig. 2), also Japan, S. China, Indo-China, Thailand, S. and E. Indian subcontinent, N. and E. Australia, Polynesia (see also under varieties).

Habitat. Occurring in hedges, thickets, river-banks, forests, and on mountains, from sea-level to 1800 m. altitude. Flowering and fruiting all the year round (at least, in Java).

Uses. *var. discolor* : The tuberous root is bitter and very poisonous due to its picrotoxin content. It is used medicinally for fever, diarrhoea, urinary diseases and stomach-ache. Crushed leaves in water form a slightly gelatinuous mass which is applied to breast infections. Reported to be poisonous to live-stock in Australia (White in Queensl. Agric. Journ. n.s. **8,** 230 (1917)).

Vernacular Names. *Java* : aroij gurrung, djadjo, djundju lalakeh, kepleng, ojod minjak, ondjo ondjo, seloro, sluru, tjiluru, tjimtjau minjak. *Moluccas* (*Ternate*) : ginato bobudo, gurnali babudo.

Notes. The very extensive synonymy of this species is the result of combining the synonyms quoted by Diels for three species, which he recognized as distinct, *viz. Stephania forsteri* (DC.) A. Gray, *St. hernandiifolia* (Willd.) Walp. and *St. japonica* (Thunb.) Miers. The only differences between these taxa concern the presence or absence of a puberulous indumentum on the lower surfaces of the leaves and on the inflorescences, as indicated in the key below. The degree of hairiness varies considerably but the great majority of the specimens I have examined can be placed in one of these three taxa, which occupy different but overlapping geographical areas. I therefore consider *St. forsteri*, *St. hernandiifolia* and

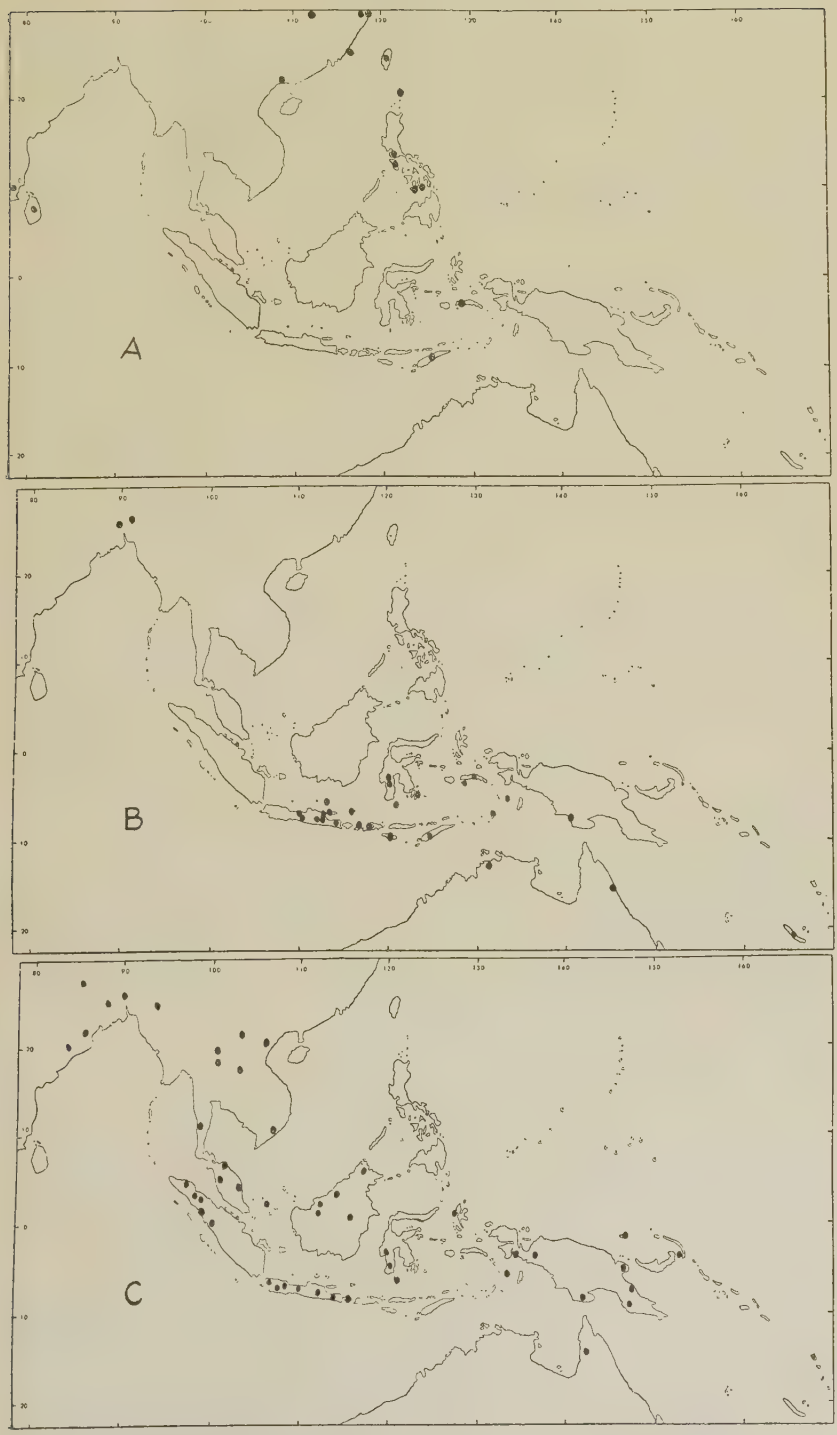

FIG. 2. Distribution of *Stephania japonica* Thunb. Miers (A) var. *japonica* ; (B) var. *timoriensis* (DC.) Forman, and (C) var. *discolor* (Miq.) Forman.

St. japonica to be no more than varieties of one widespread species, of which *St. japonica* (Thunb.) Miers is the earliest name. These " species " have been combined with one another in the past, e.g. Beccari [Malesia **1,** 154 (1877)] considered *St. forsteri* as a synonym of *St. hernandiifolia* and mentioned the variation he found in the degree of hairiness ; Gamble [Fl. Madras **1,** 29 (1915)] treated *St. hernandiifolia* as a synonym of *St. japonica.* The endocarp of *St. japonica* was described by Diels as imperforate. It is, however, usually perforate in all three varieties of this species.

A fourth species, which was recognized by Diels (*St. hallieri* Diels), is included in this species. Although Diels distinguishes *St. hallieri* by its unguiculate petals, I have not found the type specimen (*Hallier* 1832) to have markedly unguiculate petals. *Hallier* 1832 belongs to a form of *var. discolor* having acutely acuminate, prominently and minutely reticulate leaves, and inflorescences which are rather more compoundly branched than usual. This form occurs in Borneo and N. Guinea but cannot be clearly delimited as a distinct taxon. Another specimen belonging to this form is *Hallier s.n.* (Borneo, Rijang River), which Diels quoted under *St. hernandiifolia.*

The material in Thunberg's herbarium labelled *Menispermum japonicum* Thunb. consists of three sheets—" ♂ 1 ", " ♂ 2 ", and ' ♂ ", as listed by Juel (Pl. Thunb. 245 (1918)). These sheets all bear the words "Japonia Thunberg" on the reverse side. In " ♂ 1 " the leaves are distinctly puberulous below, and the inflorescences are also puberulous. This specimen therefore belongs to *var. hernandiifolia,* which is not known from Japan. Since Thunberg collected in Java both on his way to and from Japan, it seems very likely that " ♂ 1 " was collected in Java, where *var. hernandiifolia* is common. The specimen on the next sheet, " ♂ 2 ", has glabrous leaves and subglabrous inflorescences, and is therefore not typical (morphologically) for *var. japonica,* which is entirely glabrous (apart from the presence of papillae). The specimen on the third sheet, " ♀ ", which is in fruit, is completely glabrous and thus agrees with Thunberg's description of the species. I therefore choose this fruiting specimen as the lectotype of *Menispermum japonicum* Thunb.

Key to Varieties

Leaves glabrous below (region around insertion of petiole sometimes puberulous) :

Inflorescences glabrous . . . . . *var. japonica*

Inflorescences puberulous . . . . . *var. timoriensis*

Leaves puberulous below (apart from region around insertion of petiole) *var. discolor*

var. japonica

Menispermum japonicum Thunberg (1784).—*Cocculus japonicus* (Thunb.) DC. (1817).—*Stephania japonica* (Thunb.) Miers (1866).—*Clypea consummata* Miers (1871).—*Clypea effusa* Miers (1871).—*Clypea subovata* Miers (1871). -*Stephania appendiculata* Miers (1871).—*Stephania exigua*

Miers (1871).—*Stephania hypoglauca* Miers (1871).—*Stephania intertexta* Miers (1871).

[*Stephania hernandiifolia* (non (Willd.) Walp.)—Hook. f. et Thoms., Fl. Ind. **1,** 196 (1855) *pro parte*, et in Hook. f., Fl. Brit. Ind. **1,** 103 (1872) *pro parte* ; Miq., Ann. Mus. Lugd. Bat. **3,** 10 (1867) ; Maximowicz, Diag. Pl. Nov. As. **5,** 643 (1883), et Mél. Biol. **11,** 643, t. 2 (ff. 1–9) (1883) *pro parte, quoad plantae japonicae* ; Trimen, Handb. Fl. Ceyl. **1,** 45 (1893) ; Hayata Icon. Pl. Formosa **1,** 36 (1911).]

[*Stephania forsteri* (non (DC.) A. Gray)—Diels in Elm., Leafl. Philip. Bot. **4,** 1167 (1911) ; Merr., Enum. Philip. Fl. Pl. **2,** 149 (1923)].

Plant entirely glabrous ; the bracts and sepals (outer surface) sometimes papillose.

Distribution. Malaysia : Timor, Ceram, Philippines (see Fig. 2A). Also Ceylon, S.W. India (W. Ghats, Coorg, Nilgiri Hills, Palni [= Pulney] Hills), E. China, Korea, Japan, Formosa, Tonga and Society Isls.

Malaysian collections examined :—

Lesser Sunda Isls.—Timor, *Zippelius s.n.* (L).

Moluccas.—W. Ceram, Alpaputih ; April (♂), *Eyma* 3252 (K, L).

Philippines.—Mindoro : Vicinity of Puerto Galera ; Apr. (♀ fr.) *Bartlett* 13463 (A). Mansalay, Qyon Creek ; Apr. (♂), *Paniza* 170 (P.N.H. 9432) (A). Paluan ; Apr. (♀ fr.), *Ramos* 39756 (P). Pimalayan ; June (♂), *Ramos* 40945 (K, P). Abra de Ilog ; Jan. (♂), *Sulit* 13773 (L.)—Batanes, Batan Isl., Mt. Iraya ; June–July (♀ fl. fr.) *Ramos* 80201 (K, SING).—Luzon, Batangas Prov. (♂) *Cuming* 1533 (K, P).—Bohol, Aug.–Oct. (♀ fr.), *Ramos* 43246 (BM).—Negros Or., Damaguete, Cuernos Mts. ; May (♂), *Elmer* 10093 (A, BM, BO, K, L).

var. timoriensis (*DC.*) *Forman* comb. nov.

Cocculus forsteri DC. (1817).—*Cocculus roxburghianus* DC. (1817).—*Cocculus japonicus* (Thunb.) DC. var. *timoriensis* DC. (1824).—*Clypea glaucescens* Decne (1834).—*Stephania glaucescens* (Decne) Walp. (1842).—*Stephania forsteri* (DC.) A. Gray (1854).—*Clypea forsteri* (DC.) Miers (1866).—*Stephania roxburghiana* (DC.) Miers (1866).—*Stephania hernandiifolia* (Willd.) Walp. *var.* " *genuina seu glabra* " Miq. (1868).—*Stephania concinna* Miers (1871).—? *Stephania pallidula* Miers (1871).

Leaves glabrous (sometimes sparsely puberulous on the lower surface around the insertion of the petiole). Inflorescences crispately puberulous.

Distribution. Malaysia : C. and E. Java to Timor, S.W. Celebes, Moluccas (Ceram, Amboina, Kei Isles.) S.W. N. Guinea (see Fig. 2B). Also E. Bengal, N. Australia, and Polynesia (N. Caledonia, Samoa, Tahiti).

Malaysian collections examined :—

Java.—without locality : (♂) *Billardière* s.n. (P). (♀ fr. and ♂), *Horsfield* ' Menisp. 7 ' (K). (♀ fl.), *Leschenault* 141 (P).—C. Java : Pekalongan ; Sept. (♂), *Backer* 15663 (BO). Ngawen ; (♀ fr.), *Becking* 508–63 (BO). Banju Asin ; June (♀ fr.), *Beumée* 899 (BO). Kendal ; (♂), *Cordes* 63 (BO). Mt. Bawean ; June (♂), *Dorgelo* 71 (L). Ngarengan ; May (♀ fr.), *Koorders* 33604 (BO). *ibidem* ; May (st.) *Koorders* 33605 (BO) ; May (♀ fl., fr.) *Koorders* 33606 (a) (BO) ; May (♂), *Koorders* 33607 (BO) ; May (♀ fr.), *Koorders* 33608 (BO). Saddle betw. Mt. Sumbing and Mt. Sindoro, Nov. (♂), *Lörzing* 99 (BO).—E. Java : Patjitan ; Apr. (♂), *Backer* 2912 (BO). Djember ; Dec. (♂), *Backer* 17766 (BO). N. Kediri ; Jan. (♀ fr.), *Beumée* 1540 (BO). Mt. Betet ; May (♀ fl.), *Beumée* 2410 (BO). Surabaja ; (♂), *Boorsma, S.E. s.n.* 1912 (BO). Djember ;

(♀ fl.), *Dorgelo* 1993 (L). Gondang ; May (♀ fl.), *Grutterink* 3051 (BO). Ngandjuk ; May (♀ fl.), *Grutterink* 3261 (BO). Puger ; Oct. (♀ fr.), *Koorders* 21452 (BO) ; *ibidem* ; Oct. (♂), *Koorders* 21456 (BO) ; *ibidem* ; Mar. (♂) *Koorders* 30040 (BO). Kota-Madiun ; June (♂), *Koorders* 23363 (BO). Surabaja ; (♀ fl.) *Lahaie* 1803 (P). Mt. Pandan ; Dec. (♂), *Thorenaar* 241 (BO). Djember ; (♀ fl.), *Ultée* 1 (BO). Between Niamsil and Lodojo ; Sept. (♂), *Yamamoto* 1068 (BO).—Kangean Archip : Kangean Isl., N. of Ardjasa ; Mar. (♀ fl.), *Backer* 26900 (BO). Mt. Eteng ; May (♀ fl.), *Backer* 27420 (BO). Tambajangan ; Mar. (♀ fr.), *Backer* 27646 (BO). Sepapan Isl. ; Apr. (st.) ; *Backer* 28447 (BO). Paliat Isl. ; May (♀ fr.), *Backer* 29617 (BO). Sabunten Isl. ; May (♀ fl.), *Backer* 29936 (BO). –Madura : Bangkalan ; Feb. (♂), *Backer* 19091 (BO). Ketapang ; Mar. (♂), *Backer* 20007 (BO). (st.), *Coert* 772 (L).—Bawean Isl. : Langsowaho ; May (? ♂), *Karta* 95 (BO).

Lesser Sunda Isls.—Lombok : Rindjani, Sembalum plateau ; *Elbert* 1592 (L). Rindjani, Twela near Pringabaya ; June (♀ fr.), Elbert 2008 (BO, L). Sembalun ; Apr. (♀ fl., fr.), *Rensch* 330 (BO).—Sumbawa : Sultanat Dompu, Kempong ; Dec. (♂), *Elbert* 3998 (A, BO, K, L). Sultanat Sumbawa, Pussu, W. of Balu Lanteh ; Jan. (♂), *Elbert* 4156 (A, L).—Sumba : Waikelo ; Nov. (♂), *Posthumus* 3027 (BO).—Timor : (♀ fr.), *Forbes* 3608 (L). (♀ fr.), *Riedlé* 497 (P). (♂), *Riedlé* s.n. (? L, P). (♂ and ♀ fl., fr.), *Zippelius* 63/a and *s.n.* (K, L). Bibibucu ; Apr. (♀ fr.), *Forbes* 3815 (BM).—Timor Laut : (♀ fr.) *Riedel* s.n. (K).

S.W. Celebes : Enrekang ; May (♀ fl.) *Kjellberg* 1365 (BO) and 3945 (BO). Makale; *Kjellberg* 1680 (BO).—Saleijer Isl., May (♂), *Doct. v. Leeuwen* 1792 (BO).—Buton Isl., Bau Bau ; Feb. (♀ fr.), *Kjellberg* 113 (BO).

Moluccas.—Ceram, Laimu ; Dec. (♂), *Kornassi* 669 (L).—Amboina, Blahang ; *Rant* 346 (BO). Benteng ; Oct. (♂), *Rant* 560 (BO). (♀ fr.), *Robinson C. B.* 487 (BO, K, L, P).—Kei : Tual, Keteil ; Sept. (♂), *Beccari s.n.* (A, FI, K). Weri, Bandan ; Aug. (♂), *Beccari s.n.* (FI, K).

SW. N. Guinea : Merauke ; Nov. (♀ fl.), *Versteeg* 1875 (BO, K, L).

Specimen intermediate between var. *japonica* and var. *forsteri* :—

Timor : Sabale Mts. ; (♀ fr.), *Forbes* 3815 (BM).

var. discolor (*Miq.*) *Forman* comb. nov.

Cissampelos hernandiifolia Willd. (1806).—*Clypea discolor* Bl. (1825.)—*Stephania discolor* (Bl.) Spreng. (1827).—[*Cocculus finlaysoniana* Wall. (1831–2) *nom. nud.*].—*Cissampelos hexandra* Roxb. (1832).—*Clypea hernandiifolia* (Willd.) Wight et Arn. (1834).—*Stephania hernandiifolia* (Willd.) Walp. (1842).—[*Cissampelos australis* Cunn. ex Miers (1851) *nom. nud.*].—*Stephania gaudichaudii* A. Gray (1854).—*Stephania hernandiifolia* (Willd.) Walp. *var. discolor* (Bl.) Miq. (1868).—*Stephania australis* Cunn. ex Miers) A. Gray ex Miers (1871).—*Stephania latifolia* Miers (1871).—*Clypea oxyphylla* Miers (1871).—? *Stephania japonica* (Thunb.) Miers *var. puberula* Ktze. (1891).—*Stephania discolor* (Bl.) Spreng. *var. hernandiifolia* (Willd.) Boerl. (1899).—*Stephania hallieri* Diels (1910).

[*Stephania japonica* (Thunb.) Miers *non var. japonica* ; Gamble, Fl. Madras **1,** 29 (1915) *pro parte* ; Juel, Pl. Thunb. 245 (1918) *pro parte quoad Thunb.* " ♂.1 "].

Leaves crispately puberulous below. Inflorescences crispately puberulous.

Distribution. Throughout Malaysia except Philippines (see Fig. 2C). Also Indian subcontinent (Nepal, Assam, Bengal, Orissa, N. Madras), Burma, Thailand, Indo-China, E. Australia.

Malaysian collections examined :

Sumatra.—without locality : (♂ and ♀ fl., fr.), *Korthals s.n.* (K, L).—Atjeh : Gahu Luas : Mar. (♂), *Pringgo Atmodjo* 197 (BO, L). –Tapanuli : Toba ; Mar. (♀ fr.), *Ouwehaud* 139 (BO); *ibidem* ; Apr. (♂), *Ouwehaud* 246 (BO, L). Samosir ; July (♀ fl.), *Yamamoto* 89 (BO). Tapanuli, (♀ fl., fr.), *Yates* 2097 (SING).—W. Coast : Bt nan

Tigo, Mt. Malintang ; July (♀ fl.), *Bünnemeijer* 3771 (BO, L).—E. Coast : Karo Lands, near Berastagi ; July (♀ fr.), *Lörzing* 6717 (BO, L), Sibolangit ; Nov. (♀ fl.), *Lörzing* 7636 and 8042 (BO). Berastagi ; (♀ fl.), *Ridley s.n.* (K).

Malaya.—Perak : Kuala Kangsar, Lubok Merbau ; (st.), *Haniff* 15576 (SING). Tupai ; July (♀ fr.), *Wray* 2438 (SING).—Pahang, Pulau Rumput (♀ fr.) *Ridley s.n.* 1891 (SING).—Penang, Polo Boetong ; Aug. (♂), *Curtis* 1260 (P).

Java.—without locality : *Blume* 727 (L). *van Hasselt s.n.* (L). *Horsfield* 472, " Menisp. 8 " (BM). *Korthals s.n.* (L). *Millett s.n.* (K). *Spanoghe s.n.* (K, L). *Zollinger* 462 (A, BM, FI, K, L, P).—W. Java : " Schietterrein Welkrreden " ; Nov. (♀ fl.), *Backer* 57 (L). Bajah, Langkop ; June (♀ fr.), *Backer* 1716 (BO). Tjiandjur ; Sept. (♂), *Backer* 3078 (BO). Meester Cornelis ; (♀ fl., fr.), *Backer* 3307 and 31402 (BO). Mt. Tjerimai ; Oct. (♂), *Backer* 4929 (BO). Mt. Tjikoraj ; Nov. (♀ fl.), *Backer* 5293 (BO). Between Waspada and Tjisurupan ; Nov., *Backer* 5467 (BO). Between Djakarta and Tandjong Priok ; Sept. (♀ fr.), *Backer* 32399 (BO). Tanah Abang ; June (♂), *Backer* 32400 (BO) ; *ibidem*, Oct. (♀ fl., fr.), *Backer* 32401 (BO). Bantar Dawa ; Dec. (♂), *Backer* 32404 (BO). Depok ; Sept., *Backer* 32405 (BO). Sentiong ; Nov. (♀ fl.), *Backer* 33805 (BO), also *Backer* 33806 (BO, L). Tjidadap ; June (♂), *Bakh. v. d. Brink* 3515 (BO, L) and 5601 (BO). Purwakarta, Wanajasa ; July (♂), *Bakh. v. d. Brink* 4791 (BO). Mt. Miun near Mt. Parang ; July (♀ fr.), *Bakh. v. d. Brink* 4897 (BO, K, L, SING). Bogor ; *Bakh v. d. Brink jr.* 760 (BO) and 961 (L). Krawang ; Mar. (♂), *Beumée* 1722 (BO). Pamanukan ; (♂), *Blume s.n.* (L). Tjiberreureum, Tjiomas ; Sept. (♀ fl., fr.), *Boerlage* 295 (L). Mt. Gedeh ; Dec. (♀ fl.), *Danser* 6005 (P). Tjikampek ; Oct. (♀ fr.), *Engles-Julius* 4 (BO). Bogor and vicinity ; Nov. to Jan. and Mar. to Apr. (♂ and ♀ fl., fr.) *Hallier* 4a to 4h (BO, K, L). Tjikumpai ; (♂), *Harmsen* 92 (BO). Bandung ; July (? fl.), *Karsten s.n.* 1937 (L). Takoka ; Feb. (♀ fl., fr.), *Koorders* 15268 (BO). Tjigenteng ; Jan. (♀ fl., fr.), *Koorders* 26286 (BO, L). Depok ; Aug. (♀ fr.), *Koorders* 31204 (BO). Palabuan Ratu ; Apr. (♀ fr.), *Koorders* 34203 (BO). Bodjongmanik ; July (♂), *Koorders* 40901 (BO). Depok ; Feb. (st.), *Koorders* 42612 (BO). Mt. Guntur ; Feb. (♀ fr.), *Koorders* 42887 (BO). Krawang, (♀ fl., fr.), *Korthals s.n.* (L). Mt. Patuha, *Korthals s.n.* (L). Near Sindanglaja, (♀ fr.), *Ploem s.n.* (BO). Dago ; Jan. (♀ fl.), *Popta* 683 (L). Tjilendek ; June (? fl.), *Raap* 342 (L). Tjibodas ; Feb. (♀ fl.), *Ridley s.n.* 1915 (K). Tjisurupan, Papandajan ; Feb. (♂), *Ridley s.n.* 1915 (K). Mt. Gedeh, Tjibodas ; (♀ fl.), *Sapiin* 2254 (SING) ; *ibidem* (♀ fr.), *Sapiin* 2565 (L). Near Tjibogea " in agro Buitenzorgensi " ; (♂), *Schiffner* 1975 (A, BO, K, L). Kampong Nangrang ; Mar. (♀ fl.), *Schiffner* 1978 (L). " Batavia Province " ; July (♀ fr.), *v. Slooten* 505 (BO). Depok ; May (♀ fl.) *Soegandiredjo* 260 (BO). Bogor ; Dec. (♂), *v. Steenis* 46 (BO) and *ibidem* Sept. (♀ fr.), *v. Steenis* 46a (BO).—C. Java : Petung Kriana ; Sept. (♀ fr.), *Backer* 15921 (BO). Madjenang ; Jan. (♀ fr.) *Backer* 18511 (BO). Margasari ; Mar. (♀ fr.), *Beumée* 1772 (BO). Subah ; July (♀ fr.), *Beumée* 4275 (BO). Kebumen ; Nov. (? fl.), *Brinkman* 219 (BO). Winosobo ; Apr. (♀ fl.), *Brinkman* 605 (BO). Pekalongan, June (♂), *Doct. v. Leeuwen* 26 (BO). Subah ; Apr. (♀ fl.), *Koorders* 27501 (BO, L) and *ibidem*, Apr. (♂), *Koorders* 27503 (BO, L).Tjilatjap ; June (st.) *Koorders* 30907 (BO). Ambarawa, Mt. Telamojo ; May (st.), *Koorders* 35846 (BO). Nusa Kambangan Isl. ; Nov. (♀ fl., fr.), *Valeton* 238 (BO). Margasari near Tegal ; Dec. (♂), *Wolff v. Wülfing* 4868 (BO).—E. Java : Bondowoso ; Oct. (♂), *Backer* 9535 (BO). Mt. Wilis, Kediri ; Feb. (♀ fl.), *Backer* 11357 (BO). Tulung Agung ; Feb. (♀ fl.), *Backer* 11682 (BO). Malang ; June (♂), *Beumée* 2763 (BO). Sarangan ; Apr. (♂), *Coert* 200 (L), and *ibidem*, Jan. (♂), *Coert* 877 (L). Pasuruan ; (♀ fl.), *Jesweit s.n.* (L). Ngebel ; May (♂), *Koorders* 23768 (BO, L) and *ibidem* Mar. (♀ fr.), *Koorders* 29883 (BO, L). Tjuramanis ; Sept. (♀ fl., fr.), *Koorders* 28769 (A, BO, L, SING). Rogodjampi ; Sept. (♂) ; *Koorders* 29018 (BO, L). Gending Waluh ; July (♀ fr.), *Koorders* 43040 (BO, L). Road from Litjin to Banjuwangi ; June (♂), *Koorders* 43699 (BO, L). Tosari, Podokoyo ; Jan. (♂) *Ridley s.n.* 1915 (BM, K). Mt. Tengger ; Nov. (♀ fl.), *Zollinger* 558 (BO, P).—Cultivated : Bot. Gard. Bogor (♂ and ♀ fl.), *Boerlage s.n.* (L). Cult. Hort. Bog. (all ♂), XVI-D-43 (BO), XVI-D-53 (No. 258) (K), and XVI-D-53a (No. 259) (BO, L).

Lesser Sunda Isls. : Bali, Lake Batur ; Apr. (♀ fr.) *v. Steenis* 7944 (BO).

Borneo.—Sarawak : Mt. Skiwa, Baram District ; Dec. (♂) *Hose* 438 (K). Rijang River, Sibu, Kalong ; Apr. (♂), *Haviland s.n.* 1893 (BM, K, SING).—N. Borneo : Mt. Kinabalu, Penibukan ; Jan. (♂), *Clemens* 30644 (A, BM, L). Mt. Kinabalu, Dallas ; Nov. (♀ fr.), *Clemens* 26918 (A, K, L).—Indonesian Borneo : Mt. Kenepai ; (♂), *Hallier* 1832 (BO, L). W. Kutai, near L. Puhus ; Nov. (? fl.), *Endert* 4952 (L) and *ibidem*, near L. Petah ; Feb. (♂), *Endert* 4077 (L).—Anamba Isls., Siantan, near Terempa ; Mar. (♂), *v. Steenis* 806 (BO, L).

Celebes.—C. Celebes, Parampe ; July (♂) *Rachmat* 301 (BO).—SW. Celebes, Bantimurung waterfall ; Nov. (♂), *Rant* 897 (BO).—Saleijer Isls., Tanahdjampea ; May (♂), *Doct. v. Leeuwen* 1626 (BO).

Moluccas.—Ternate, Dufa-Dufa ; Nov. (♀ fl.), *Beguin* 1087 (BO, L). N. Castela ; May (♂), *Beguin* 1624 (BO, L).—Kei Isls., (♀ fr.) *Treub* 356 (BO).

New Guinea.—West N. Guinea : Kaimana ; June, (♂), *Aet* 189 (L). Nassau Mts. ; Oct. (♂), *Doct. v. Leeuwen* 10694 (A, K, L).—Papua : W. Division, Wassi Kussa R., Tarara ; Dec. (♂), *Brass* 8523 (A, BO, L). Kanosia ; Feb. (♂), *Carr* 11480 (BM, K, L, SING). Lala River ; Oct. (♂), *Carr* 13973 (BM, K, L, SING). Boridi ; Oct. (♂), *Carr.* 14755 (BM, K, L, SING) and *ibidem*, Nov. (♀ fl., fr.), *Carr* 14921 (A, BM, K, L, SING). Isuarava ; Feb. (♂), *Carr* 15353 and 15577 (A, BM, K, L, SING) and *ibidem*, Mar. (♂), *Carr* 15881 (SING). [without locality] ; (♂), *Carr* 15981 (SING). Isuarava ; Mar. (♀ fr.) *Carr* 16042 (SING).—N.E. N. Guinea : Morobe District, Sattleberg, Boana ; June (♀ fr.) *Clemens* 8295a and 8362 (A). Morobe Distr., Markham Valley, Kajabit ; July (♂), *Clemens* 10496 bis (A). Morobe Distr. Bulolo ; Feb. (♂), *Fryar* 3994 (A, K, L). Kelana ; July (? fl.), *Hellwig* 25 (BO, K).—Admiralty Isls. ; Mar. (♂), *Moseley s.n.* 1875 (BM, K).—Bismarck Archip. : Utuan Isl. (♂ and ♀ fr.), *Warburg* 20090 (A).

Specimens intermediate between *var. timoriensis* and *var. discolor* :—

C. Java : E. Tegal ; Mar. (♀ fl.), *Beumée* 1916 (BO) and *ibidem* Jan. (♀ fr.), *Beumée* 3737 (BO).—Celebes : Bonto Parang ; Mar. (♀ fr.), *Bünnemeijer* 10656 (BO, L). Gorontalo, (♀ fr.), *Riedel s.n.* (K, P).—Moluccas, Kei Isls., Ohoidir near Tual ; May (♂), *Jensen* 382 (BO, L).—NE.N. Guinea : (♂), *Weinland s.n.* 1889–91 (SING).

4. **Stephania venosa** (*Bl.*) *Spreng.*, Syst. Veg. **4** (2) 316 (1827) ; Walp., Rep. **1,** 96 (1842) ; Diels in Engl. Pflanzenr. Menisp. 271 (1910) ; Koorders, Exk. Fl. Java **2,** 336 (1912) ; Backer, Bekn. Fl. Java (em. ed.) **3,** fam. 34, 18 (1941) ; Masamune, Enum. Phan. Born. 276 (1942) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 141 (1944).

Clypea venosa Bl., Bijdr. 27 (1825). Type : Java, Mt. Burangrang, *Blume s.n.* (lecto. L !).

Stephania prapatensis Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 143 (1944). [Type not seen].

[*Stephania rotunda* Lour. *sensu auct.*—Miq., Ann. Mus. Lugd. Bat. **4,** 86 (1868) ; Sheffer in Nat. Tijdschr. Ned. Ind. **32,** 401, tab. 14 (1873) ; Beccari, Malesia **1,** 155 (1877) ; Ridley in Journ. Str. Br. Roy. As. Soc. **54,** 15 (1910), et *loc. cit.* **59,** 67 (1911), *sphalm.* '*rotundifolia*', et Fl. Mal. Pen. **1,** 113 (1922)].

[*Stephania hernandiifolia* (non (Willd.) Walp.)—Ridley in Journ. Str. Br. Roy. As. Soc. **59,** 67 (1911).]

Slender climber up to about 20 m. high containing red sap (? always). *Stem* herbaceous, glabrous. *Leaves* with glabrous petioles (3–) 6–22 cm. long ; lamina broadly triangular-ovate, often slightly lobed, 6–20 cm. long, 6–20 cm. broad, apex obtusely mucronulate, base slightly emarginate ; palmately 9–12-nerved ; lower surface rather pale with a darker venation (*in sicco* usually reddish-brown) very minutely papillose, otherwise glabrous ; upper surface usually darker, glabrous ; submembranous. *Male inflorescences* an axillary, peduncled, umbelliform cyme, with peduncle 4–11 cm. long, papillose (occasionally glabrous), usually solitary. *Male flowers* yellow to orange with pedicels 1–2 mm. long : sepals 6, papillose outside, outer 3 oblanceolate, 2·0–2·5 mm. long, 0·75–1·0 mm. broad, inner 3 obovate, unguiculate, 2·0–2·5 mm. long, 1·25–1·5 mm. broad ; petals 3, obdeltoid-obovate, 1·25–1·5 mm. long and broad, glabrous ; synandrium 1–1·75 mm. long. *Female inflorescence* similar to male. *Female flowers* with pedicels about 1 mm. long, asymmetrical : sepal 1, elliptic-oblong to obovate, 1·0–1·25 mm. long, 0·5 mm. broad, papillose or glabrous outside ; petals 2, ± suborbicular to obdeltoid, 0·5–0·75 mm. in diameter, glabrous ; ovary ± ellipsoidal, 1·0–1·5 mm. long, 0·5–0·75 mm. broad ; stigma shortly 3–6-lobed.

Fruit red with pedicels up to 7 mm. long, obovate in outline, 6–9 mm. long 5–6 mm. broad. Endocarp perforate, dorsally bearing 4 longitudinal rows of 12–16 papilliform tubercles.

Distribution. N. Sumatra, N. Malaya (Perlis and Langkawi Isls.), Java, N. Borneo (Mt. Kinabalu), Philippines (Luzon) and S.W. Celebes (see Fig. 3).

Habitat. On hillsides, plains and mountains, scattered in forests up to 1600 m. altitude.

Vernacular Name. *Java* : gorong bodas.

Fig. 3. Distribution of *St. venosa* (Bl.) Spreng.

Notes. From its original description, *Stephania prapatensis* Yamamoto clearly belongs to this species, it is therefore included in the above synonymy. *Corner* 37820 from the Langkawi Isls. is referred to this species with some doubt on account of the prominent, fleshy, gland-like process on the inner face of each petal. This process was not found in the other collections from the Langkawi Isls. Furthermore, the leaves of *Corner* 37820 are thicker than is usual for *St. venosa*, which fairly constantly has submembranous leaves.

Collections examined :—

Sumatra.—without locality, *Korthals s.n.* (K, L). Sibolangit ; Dec. (♂), *Karta* 79 (BO). *ibidem* ; Aug. (♂), *Lörzing* 4383 (BO). *ibidem*, Apr. (♂), *Lörzing* 5056 (BO, L).

Malaya.—Perlis : Telor Jambu ; Mar. (♂), *Ridley* 15164 (BM, K, SING). Tebing Tinggi ; (♀ fr.), *Ridley s.n.* 1910 (SING).—Langkawi : Sept. (♂), *Curtis s.n.* 1890 (K, SING). Mar. (♂), *Curtis s.n.* 1892 (K, SING). ? [Pulau Chupa ; Nov. (♂), *Corner* 38720 (K).]

Java.—W. Java : Mt. Malabar ; Oct. (♂ and ♀), *Anderson, T.* 18 (K). Mt. Tjerimai ; Oct. (♀ fl.), *Backer* 4832 (BO, K, L, SING). Mt. Salak ; (♂), *Backer* 9113 (BO, L). *ibidem* ; Nov. (♂), *Blume* 721 (L). Burangrang ; Sept. (♂), *Blume s.n.* (L). Tjibodas ; Mar. (♀ fl.), *Bruggerman* 29 (BO, L). Mt. Gede ; Dec. (♀ fl.), *Danser* 5811 (P). Tjibodas ; Jan. (st.), *Hallier* 772a (BO). Bogor ; Nov. (♂), *Hallier* 772b (BO). Mt. Salak ; Sept. (♀ fr.), *Koorders* 24288 (BO, K). Tjibodas ; Oct. (♀ fl.), *Koorders* 25871 (BO, K, SING) and 25895 (BO). *ibidem*, Oct. (♀ fr.), *Koorders* 31544 (BO, L). *ibidem* Apr. (♀ fr.), *Koorders* 42851 (BO, L). Pangentjongan ; Jan. (♂), *Koorders*

26475 and *ibidem*, Jan. (♀ fl.), *Koorders* 27066 (BO). Preanger ; *Koorders* 44596 and 44597 (BO). Mt. Salak ; June (♂), *Raap* 613 (L). Mt. Liiang ; Oct. (♀ fr.), *van Steenis* 2364 (BO, L). C. Java : Dara ; Sept. (♂), *Backer* 15718 (BO, L). Josoredjo ; Sept. (♂), *Backer* 16199 (BO, K, L). E. Java : Pasuruan ; Jan. (st.), *Backer* 37271 (L). Puger, *Koorders* 21451 (BO).

N. Borneo : Mt. Kinabalu, Dallas ; Aug. (♀ fr.), *Clemens* 26202 (BM, K, L). *ibidem* ; Sept. (♂), *Clemens* 26264 (K, L). *ibidem*, Nov. (♂), *Clemens* 26918 (BM).

Philippines.—Luzon : ? [Cagayan Prov., near Peñablanca ; May (♀ fr.), *Adduru* 171 (A, K).] Benguet, Twin Peaks ; May (♀ fr.) Elmer 6412 (US). Montalban ; May (♂ and ♀ fr.), *Loher* 5547 (BO, K, US). ? [Batangas Prov. ; May (♀ fl.), *Ramos and Deroy* 22647 (A, BO, K, US)].

S.W. Celebes : Todjambu ; July (♂), *Kjellberg* 3945a (BO).

5. **Stephania corymbosa** (*Bl.*) *Walp.*, Rep. **1,** 96 (1842) ; Miq., Fl. Ind. Bat. **1** (2) 84 (1858), et Ann. Mus. Lugd. Bat. **4,** 86 (1868) ; Beccari, Malesia **1,** 155 (1877) ; Diels in Engl. Pflanzenr. Menisp. 267 (1910) ; Backer, Schoolfl. Java, 46 (1911) ; Koorders, Exk. Fl. Java **2,** 336 (1912) ; Backer in Bull. Jard. Bot. Buit. II, **12,** 31 (1913) ; Ridl. in Journ. Fed. Mal. Stat. Mus. **8** (4) 14 (1917), et Fl. Mal. Pen. **1,** 113 (1922) ; Merr., Enum. Born. Pl. 250 (1921) ; Burkill et Hend. in Gard. Bull. Str. Settl. **3,** 344 (1925) ; Norman in Journ. Bot. **64,** Suppl. 142 (1926) ; Backer, Bekn. Fl. Java (em. ed.) **3,** fam. 34, 19 (1941) ; Masamune, Enum. Phan. Born. 276 (1942); Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 137 (1944).

Clypea corymbosa Bl. Bijdr. 27 (1825). Type : W. Java, Mt. Salak, *Blume* s.n. (holo. L !, ? iso. K !).

Stephania ramuliflora Miers [in Ann. Mag. Nat. Hist. III. **18,** 16 (1866) *nom. nud.*], Contrib. Bot. **3,** 232 (1871). Type : S.E. Borneo, Banjermasin, *Motley* 1108 (holo. K !).

? *Stephania cauliflora* Becc., Malesia **1,** 155 (1877) ; Diels in Engl. Pflanzenr. Menisp. 267 (1910) ; Holthuis et Lam in Blumea **5,** 180 (1942). Type : Celebes, Lepo-Lepo, near Kendari, *Beccari s.n.* 1874 (holo. FI !).

Stephania catosepala Diels in Engl. Pflanzenr. Menisp. 268 (1910), et in Elmer, Leafl. Philip. Bot. **4,** 1166 (1911) ; Merr., Enum. Philip. Fl. Pl. **2,** 149 (1923) *pro. parte, excl. Merrill* 828, 9705 et *Santos* 31806. Type : Philippines, Luzon, Benguet Prov., Baguio, *Elmer* 5851 (isos. K !, P !, US !).

Stephania merrillii Diels in Engl. Pflanzenr. Menisp. 268 (1910), et in Elmer, Leafl. Philip. Bot. **4,** 1166 (1911) ; Merr., Enum. Philip. Fl. Pl. **2,** 150 (1923) ; Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 137 (1944). Type : Philippines, Mindoro, Mt. Halcon, *Merrill* 5701 (holo. B !, iso. US !).

Stephania ramosii Diels in Merr. in Philip. Journ. Sci. Bot. **7,** 265 (1912) ; Merr., Enum. Philip. Fl. Pl. **2,** 150 (1923). Type : Philippines, Luzon, Benguet Prov., *Ramos* 13487 (holo. B !).

? *Stephania borneensis* Yamamoto in Journ. Soc. Trop. Agric. **16** (3) 137 (1944). [Type not seen].

[*Stephania menadonensis* Diels ex Koord.-Schumacher, Syst. Verzeich. Herb. Koord. Abt. III. Celebes 41 (1914) *nom. nud.*].

[*Stephania hernandiifolia* (non (Willd.) Walp.)—Koord. in Meded. 's-Lands Plant. **19,** 340 (1898)].

Woody climber about 5–12 m. high, main stem about 1–2 cm. thick. *Stem* glabrous, bark rather smooth. *Leaves* with glabrous petioles 3–19 cm. long ; lamina broadly triangular-ovate to suborbicular (often narrowly triangular-ovate in Luzon) 3·5–13 (–19) cm. long, 3–11 (–17) cm. broad, apex acute and usually rather abruptly acuminate, sometimes gradually narrowing or obtuse, base broadly rounded to truncate ; margin sometimes revolute ; palmately 10–13-nerved ; reticulation moderate, usually more dinstinct on lower surface ; upper surface often very minutely sub-papillose (due to large convex epidermal cells), glabrous ;

Fig. 4. Distribution of *St. corymbosa* (Bl.) Walp.

lower surface often sub-glaucous, glabrous ; chartaceous to subcoriaceous. *Male inflorescence* often borne on the older, leafless parts of the stem, but axillary in young shoots, up to 10 (–15) cm. long, composed of peduncled umbelliform cymes racemosely arranged, papillose-puberulous to glabrous. *Male flowers* white, yellowish or orange with pedicels up to 3 (–4) mm. long ; sepals 6, glabrous or subglabrous outside, outer 3 ± narrowly oblong 1·25–1·75 mm. long, 0·25–0·5 mm. broad, apex obtusely pointed, inner 3 obovate 1·25–1·5 mm. long, 0·75–1·25 mm. broad, apex broadly rounded ; petals 3, ± broadly obtriangular, about 0·75 mm. long, apical margin membranous, lateral margins sometimes involute, papillose-puberulous inside towards base ; synandrium 0·75–1 mm. long. *Female inflorescence* similar to male but branches becoming much thicker at fruiting stage, main axis up to 3 mm. thick and up to 20 cm. or more long. *Female flowers* sessile : sepals 2 or 3, ± elliptic, 0·5 mm. long ; petals 2 or 3, broadly obtriangular, scarcely 0·5 mm. long, papillose or glabrous within ; ovary ± ellipsoidal, 0·75 mm. long, 0·5 mm. broad ; stigma with 3–5 very short, reflexed, triangular lobes. *Fruits* red, sessile or subsessile (but ultimate branchlets of inflorescence sometimes look

like pedicels), suborbicular to obovate in outline, 6–10 mm. long, 6–8 mm. broad. Endocarp perforate, dorsally bearing 4 longitudinal rows of (10–) 12–19 transversely hooked tubercules, those of the 2 inner rows directed inwards and those of the 2 outer rows directed outwards (rarely the hooks scarcely or not developed).

Distribution. Sumatra, Malaya (Maxwell's Hill, Perak), W. Java, Borneo, Philippines, C. and NE. Celebes (see Fig. 4).

Habitat. Occurring in thickets and forests up to 1800 m. altitude, Flowering and fruiting all the year round.

Vernacular Names. *Java* : areuj geureung, geureng areni. *Celebes* : karokas sela.

Notes. In *Das Pflanzenreich*, Diels distinguishes between *St. corymbosa* (Bl.) Walp., *St. cauliflora* Becc., *St. catosepala* Diels and *St. merrillii* Diels by using the following characters in his key : relative length of lamina and petiole, shape of sepals, leaf-texture, and thickness of synandrium-column. In the material I have examined, the distinctions made by Diels are not reliable, nor do there seem to be any other characters which could be used to distinguish more than one species in this group. Specimens from the Philippines tend to have leaves with petioles shorter than the lamina in contrast to non-Philippine specimens, in which the petiole is usually longer than the lamina. Specimens from Luzon often have much narrower leaves (narrowly triangular-ovate) than specimens from other regions.

St. ramosi Diels was distinguished from *St. catosepala* Diels in the original description by having petals and sepals half the size of those of *St. catosepala*. Examination of the type specimens of both species, however, has shown that there is no significant difference between them in the size of these organs, and that the specimens undoubtedly belong to the same species.

The inflorescences usually arise on the older, leafless regions of the stems, but on younger stems they may arise in leaf axils. In *Haviland* 2108 (Sarawak ; Kew specimen) and *Carr* 26600 (N. Borneo) the inflorescences are reduced and arise on the stem from warty protuberences which appear to be formed from the bases of inflorescences of previous seasons. This condition is also present in another specimen from Borneo, *Richards* 1126 (Sarawak), where the inflorescence is less than 1 cm. long. The flowers of this specimen have completely glabrous petals ; this specimen is referred to this species with some doubt.

St. cauliflora Becc. was described from a male specimen collected by Beccari in S.E. Celebes and was distinguished by its very short inflorescences (1–1·5 cm. long) and ovate leaves, rounded at the apex. I have seen no other specimen similar to this one. The specimens referred to *St. cauliflora* by Diels have inflorescences and leaves typical of *S. corymbosa*. The inflorescences on Beccari's specimen closely resemble those on the specimens from Borneo referred to above and they may similarly be reduced. On the sheet of Beccari's specimen at Florence the inflorescences are all detached in a paper capsule and it is not possible to be certain that they originate from the portion of stem on the sheet, which does not show bases of previous seasons' inflorescences as the Bornean specimens do. The floral characters of Beccari's specimen exactly match

those of *St. corymbosa*. The rounded apex of the leaves does not agree with *St. corymbosa* but, in the absence of further material from S.E. Celebes, I prefer to refer to Beccari's specimen to *St. corymbosa*, although with some doubt. *St. cauliflora* Becc. is therefore provisionally included in the synonymy of this species.

The endocarp of *St. corymbosa* is characterised by the 4 dorsal longitudinal rows of transversely directed hooks, which are developed to various degrees of prominence in specimens from different localities. Only at the extreme eastern and western limits of the geographical range of the species are the hooks not, or only scarcely, developed—i.e. in the Simalur Isls. and in Celebes.

Collections examined :—

Sumatra.—Simalur Isl. ; Feb. (♀ fr.), *Achmad* 908 (BO), *ibidem* ; Jan. (♀ fr.), *Achmad* 1591 (BO, L). Padang, Ayer mantjur ; Aug. (st.), *Beccari* P.S. 619 (FI, K, L), *ibidem* (♂), *Beccari* P.S. 742 (BM, FI, K, L). Siolak Daras, Korinchi ; Mar. (♂), *Robinson and Kloss s.n.* 1914 (BM, K). Laeaonan ; July (st.), *Yamamoto* 555 (BO).

Malaya.—Perak, Maxwell's Hill ; Feb. (♀ fr.) *Burkill and Haniff* 12832 (K, SING), *ibidem*, Nov. (♂), *Wray* 4184 (K, SING).

Java.—without locality, *van Hasselt s.n.* (L).—W. Java : Tjibbeer, near Nanggung ; Dec. (♂), *Backer* 10573 (BO, L). Nirmala ; Dec. (♂), *Backer* 11189 (BO, L). Mt. Tjiparaj ; July (♂), *Backer* 15017 (BO, L). Mt. Salak ; (♀ fl., fr.), *Blume s.n.* (K, L). Bantam, *Forbes* 491 (BM, BO, FI). Near Seuseupan, *Scheffer s.n.* (BO). Tjiesek, Megamendung ; Sept. (♂), *van Steenis* 2229 (BO).

Borneo.—Sarawak : Kuching, *Hanada* B017 (BO), *ibidem*, Jan. (♂), *Haviland* 2108 (K, L). ? [Mt. Dulit ; Aug. (♂), *Richards* 1126 (K, SING).]—N. Borneo : *Agama* 1024 (K). Keningau ; Feb. (♀ fl.), *BNB (Castro)* 1632 (BO, K). Bettotan, near Sandakan ; Aug. (♀ fr.) *Boden-Kloss* 19126 (SING). Mt. Kinabalu, Menetendok gorge ; Mar. (♂), *Carr* 26600 (SING). *ibidem*, Dallas ; Oct. (♀ fr.), *Clemens* 26663 *partim* (A, BM, L). *ibidem*, Marai Parai ; Mar. (♀ fr.), *Clemens* 32430 *partim* (BM, K, L). *ibidem*, Apr. (♀ fr.), *Clemens* 32661 *partim* (A, BM).—Indonesian Borneo : Mt. Kenepai, *Hallier* 1747 (BO). Banjermasin, *Motley* 1108 (K). Danau-Salak, *Yamamoto* 923 (BO). Between Klua and Tangkan, *Yamamoto* 953 (BO).

Philippines.—Mindoro : Mt. Yagaw, Mansalay ; Jan. (♀ fl.), *Conklin* 17361 (A, L). Mt. Halcon ; Nov. (♂), *Merrill* 5701 (B, US). Mt. Calavite ; Apr. (♂), *Ramos* 39496 *partim* (A, P).—Batanes, Batan Isl., Mt. Iraya, *Ramos* 80080 (K) and 80240 (K).—Luzon: Benguet Prov., Baguio ; (♂), *Elmer* 5851 (K, P, US). Sorsogon Prov., Irosin ; Aug. (♂), *Elmer* 16977 (A, BO, GH, K, US). Laguna, Los Baños ; July (♀ fr.), *Elmer* 18259 (BO, GH). Benguet Prov. ; May (♂), *Ramos* 13487 (B). Rizal Prov., Mt. Irid ; Apr. (♂), *Ramos* 42136 (SING).—Bohol, *Ramos* 43336 (A, US).—Negros, Damaguete, Cuernos Mts. ; May (♀ fr.), *Elmer* 10040 (A, BM, BO, FI, K, L, US). *ibidem* ; June (♂), *Elmer* 10266 (A, BM, BO, FI, K, L, US).—Mindanao, Zamboanga Distr., Mt. Tubuan ; Oct. (♀ fr.), *Ramos and Edano* 36614 (A, K, US).

N. Celebes.—Tondano ; Aug. (♀ fr.), *Forsten s.n.* (L). Minahasa, Kajuwatu ; Feb. (♀ fr.), *Koorders* 17998 (BO, L). Minahasa ; Jan. (♀ fr.), *Koorders* 18101 (BO). *ibidem*, Paku-Ure ; Apr. (♂), *Koorders* 18102 (BO, L). *ibidem*, Amurang ; Apr. (♂), *Koorders* 18104 (BO).—C. Celebes : Malili, Kawata ; Sept. (♀ fr.), *Kjellberg* 2365 (BO).

6. **Stephania psilophylla** (*Presl*) *Forman* comb. nov.

Cissampelos psilophylla Presl, Reliq. Haenk. **2,** 80 (1835) ; F.-Vill., Novis. App. 8 (1880). Type : Luzon, *Haenke s.n.* (iso. BM !).

[*Stephania corymbosa* (non Bl.)—Turcz. in Bull. Soc. Nat. Hist. Mosc. **27** (2) 281 (1855)].

[*Stephania hernandiifolia* (non (Willd.) Walp.)—Vidal, Phan. Cuming. Philip. 93 (1885) *pro parte*, excl. *Cuming* 1533 ; et Rev. Pl. Vasc. Filip. 45 (1886)].

[*Stephania japonica* (non (Thunb.) Miers)—Merr., Enum. Philip. Fl. Pl. **2,** 149 (1923) *pro. parte*].

[*Stephania catosepala* (non Diels)—Merr., Enum. Philip. Fl. Pl. **2**, 149 (1923) *pro. parte*].

Slender climber. *Stem* herbaceous, up to 2 mm. diam., glabrous. *Leaves* with petioles 2–9 cm. long, petioles glabrous or sometimes sparsely puberulous towards the top ; lamina ovate to broadly ovate, 5–9 cm. long, 4–8 cm. broad, usually acuminate towards the apex, acumen obtusely mucronulate, base broadly rounded to very slightly emarginate ; palmately 8–11-nerved ; very fine and regular, raised reticulation on both surfaces, glabrous, but lower surface sometimes puberulous around insertion of petiole ; chartaceous. *Male inflorescence* axillary (often slightly supra-axillary) consisting of very slender, compound umbelliform cymes with filiform peduncles 1–4 cm. long, occasionally solitary or more often several along an axillary shoot, which is sometimes leafy ; usually glabrous, sometimes puberulous ; frequently provided at the base with

Fig. 5. Distribution of *St. psilophylla* (Presl) Forman (●) and *St. reticulata* Forman (+).

minute scales, pale, often puberulous, triangular to subulate, about 1–2 mm. long. *Male flowers* white, entirely glabrous with pedicels 1–2 mm. long, arranged in clusters : sepals (6 or) 8, elliptic to (broadly) oblanceolate, 1·0–1·5 mm. long, 0·5–1·0 mm. broad, apex obtuse ; petals (3 or) 4, broadly obovate to obdeltoid, about 0·5 mm. long ; synandrium about 0·5 mm. long. *Female inflorescence* similar to male but cymes usually solitary. *Female flowers* with very short pedicels, about 0·5 mm. long, or sessile, entirely glabrous ; sepals 3 or 4, ± elliptic about 0·75 mm. long, 0·25 mm. broad ; petals as in male flowers ; ovary ellipsoidal, 1 mm. long ; stigma divaricately 3–5-lobed. *Fruits* red with filiform pedicels 2–4 mm. long, obovate to broadly obovate in outline, 4–5 mm. long, 3·5–4 mm. broad. Endocarp perforate, dorsally bearing 2 longitudinal rows of 7–9 transverse ridges which are sometimes transversely 2-lobed or divided, thus forming 4 longitudinal rows of papilliform tubercles ; surface rugulose between ridges or tubercles.

Distribution. Luzon (see Fig. 5).

Habitat. Reported from primary forests and from the edges of forests at altitudes from 100 to 1300 m.

Notes. This species has usually been confused with *St. japonica* (Thunb.) Miers var. *japonica*, which also occurs in Luzon ; but *St. psilophylla* can easily be distinguished from it by the pedicellate male flowers and fruits, and the very finely and regularly reticulate leaves. The isotype of *Cissampelos psilophylla* Presl at the British Museum is erroneously labelled " Peruvia ". Presl described the species from Luzon, where it is endemic.

Collections examined :—

Philippines.—Luzon : Mountain Prov., near Baguio, *Clemens* 51852 (US). Albay Prov., *Cuming* 1160 (BM, K, FI, L, P). Ilocos Norte ; Mar. (♀ fr.), *Darling* 19052 (US). *ibidem*, Mt. Quebrada ; Feb. (♂), *Edano* 17807 (L). *ibidem*, Mt. Pico de Loro ; Mar. (♂), *Edano* 17988 (L). *ibidem*, Mt. Darna ; Mar. (♀ fr.), *Edano* 18137 (L). Pampanga Prov., Mt. Pinatubo ; May (♀ fl., fr.), *Elmer* 22221 (BM, BO, GH, K, L). Zambales, Mt. Pinatubo ; July (♀ fr.), *Fox* 4827 (A). (*sphalm.* " Peruvia ") ; (♀ fl.), *Haenke s.n.* (BM). Benguet ; May (♀ fl.), *Merrill* 828 (FI, US), *ibidem* ; May (♂), *Merrill* 9705 (BM, BO, K, L, US). Bontoc ; Jan. (♂), *Ramos* 5996 (BO, L, US). Ilocos Norte, Bangui ; Feb.–Mar. (♂) *Ramos* 27405 (BO, L, US). *ibidem* ; Aug. (♀ fr.), *Ramos* 33121 (K, P). Benguet, Pauoi ; *Santos* 31806 (BO, L). Bontoc ; Apr. (♂), *Vanoverbergh* 29 (A, FI, L). Benguet, *Vidal* 1124 (FI, K, L).

7. **Stephania reticulata** *Forman* sp. nov., inflorescentiis masculis minimis axillaribus cum floribus pedicellatis, fructibus pedicellatis, endocarpiis dorso asperrimis cum tuberculis irregulariter divisis distinguitur.

Frutex scandens. *Caulis* glaber vel sparse et minute puberulus. *Folia* petiolis 4–6 (–12) cm. longis, glabris vel apicem versus puberulis ; lamina triangulari-ovata 7–10 cm. longa et 5–8 cm. lata, apice plerumque acuminata, acumine obtuse mucronulato vel interdum acute acuminato, basi truncata vel late rotundata, palmatim 9–12-nervis, subtus tenuissime, ± aequaliter et prominenter reticulata, glabra vel basim versus nervorum sparse et minute puberula, supra laxius reticulata, glabra, chartacea. *Inflorescentiae masculae* axillares minimae minus quam 1·5 cm. longae, glabrae, e cyma umbelliformi solitaria vel e cymis paucis e ramo axillari brevissimo exorientibus compositae. *Flores masculi* pedicellis c. 1·25–1·5 mm. longis in corymbis densis subglobosis c. 3 mm. diametro dispositi : sepala 6 elliptica vel oblanceolata 1–1·25 mm. longa et 0·75 mm. lata, apice obtusa ; petala 3 late obovata, marginibus lateralibus involutis, 0·5 mm. lata et 0·75 mm. longa, apice truncata, glabra ; synandrium 0·75–1 mm. longum. *Inflorescentiae foemineae* masculis similes sed multo majores, pedunculis 3–6 cm. longis (in fructu), subglabrae vel minute puberulae. *Flores foeminei* pedicellis brevissimis c. 0·5 mm. longis vel subsessiles : sepala 3 ± elliptica, 0·75–1 mm. longa et 0·5 mm. lata, glabra vel extra papillosa ; petala 3, masculis similia ; ovarium ellipsoidale, 1 mm. longum et 0·5 mm. latum ; stigma laciniatim et divaricatim 3–5-lobatum. *Fructus* flavi vel rubri, pedicellis 3–5 mm. longis vel interdum sessiles, ambitu obovati vel suborbiculati, 7–9 mm. longi et 7–8 mm. lati. *Endocarpium* perforatum dorso asperrimum, 4 seriebus 9–11 tuberculorum ad apices irregulariter divisorum ornatum ; tuberculo serierum 2 interiorum ± virgiformia, 2 exteriorum lamelliformia marginibus exterioribus aduncis.

Typus : N. Borneo, Mt. Kinabalu, Dallas, *Clemens* 30377 (holotypus in K, isotypi in A, L).

Distribution. W. Java and N. Borneo (Mt. Kinabalu), (see Fig. 5).

Habitat. Occurring in forests on Mt. Kinabalu between 1000 and 1700 m. altitude. Collected twice in W. Java in forests at 500 and 1000 m. altitude.

Notes. This species is clearly distinguished from others by its very small, axillary, male inflorescences bearing shortly pedicellate flowers, and also by the pedicellate fruits containing remarkable endocarps which dorsally bear 2 inner rows of ± rod-like tubercles and 2 outer rows of thin, transverse, plate-like tubercles, which are hooked on the outer margin. The tubercles are irregularly divided at their tips and the whole dorsal surface of the endocarp between the tubercles is very rough.

Collections examined :—

W. Java : Mt. Karang near Pandeglang ; Mar. (♀ fr.), *Backer* 7510 (BO, L). Mt. Kendeng near Tjianten, S. of Leuiwiliang ; Sept. (♂), *Backer* 25883 (BO).

N. Borneo. Mt. Kinabalu : Near Bundu Tuhan ; July (♀ fl.) *Carr* 27776 (SING). Dallas ; Nov. (♀ fr.), *Clemens* 30377 (A, K, L). Tenompok (♀ fr.), *Clemens* 28714 *parte* (K). Dallas ; Oct. (♀ fr.), *Clemens* 26667 (A, K, L). Bundu Tuhan ; Jan. (♀ fr.), *Clemens* 28043 (BM). Tinompok trail ; Aug. (♂), *Clemens s.n.* 27.8.1931 (BM). Dallas ; Sept. (♀ fr.), *Clemens s.n.* 29.9.1931 (BM).

8. **Stephania zippeliana** *Miq.*, Ann. Mus. Lugd. Bat. **4,** 86 (1868) *pro parte, excl. folia* ; Scheffer in Ann. Jard. Bot. Buit. **1,** 5 (1876) ; Beccari, Malesia **1,** 153 (1877) ; Diels in Engl. Pflanzenr. Menisp. 266 (1910), et in Nova Guinea **8,** 869 (1912) ; Ridley in Trans. Linn. Soc. II. **9,** 16 (1916) ; Diels in Nova Guinea **14,** 80 (1923) ; Kanehira et Hatusima in Bot. Mag. Tokyo **56,** 474 (1942). Type : N. Guinea, *Zippelius* 18 (? 5)d *pro parte, excl. folia* (holo. L !).

Stephania florulenta Beccari, Malesia **1,** 153 (1877). Type : West N. Guinea, Andai, *Beccari* P.P. 664 (holo. FI !).

Woody climber up to about 10 m. high. *Stem* glabrous with supra-axillary tufts of triangular to subulate scales 1–3 mm. long ; main stems becoming woody and up to about 1·5 cm. in diameter, covered with flaky bark. *Leaves* with glabrous petioles (6–) 10–19 cm. long ; lamina broadly ovate to suborbicular (11–) 16–22 (–27) cm. long, (7–) 10–17 (–22) cm. broad, apex very acutely acuminate or obtuse, base rotund, margin sometimes slightly sinuate ; palmately 9–13-nerved ; upper surface smooth and slightly shining, usually with a raised, very minute reticulation, sometimes ± minutely areolate ; lower surface usually with minute, raised reticulation (often with minute epidermal ridges running along and between the nervules) ; chartaceous to coriaceous. *Male inflorescences* very long (? up to about 100 cm. long) arising from old, leafless stems, composed of compound umbelliform cymes with stout peduncles up to 23 cm. long arranged racemosely along and subumbellately at the end of a long axis (? up to about 80 cm. long), 2–3 mm. thick, minutely puberulous to glabrous. *Male flowers* white with pedicels 1–4 mm. long : sepals 6, ± oblong-elliptic, 1·25–2·5 mm. long, 0·25–0·75 mm. broad, glabrous ; petals 3, usually ± broadly obovate, (0·25–) 0·75–1·5 mm. long, (0·25–) 0·5–0·75 mm. broad, glabrous ; synandrium 0·5 mm. long. *Female inflorescence* similar to male but smaller. *Female*

flowers (incompletely known) : [sepals 3, petals 3 *fide* Beccari] ; ovary ovoid about 1 mm. long. – *Fruits* with pedicels 2–6 mm. long, broadly obovate to suborbicular in outline, 7–10 mm. long, 6–8 mm. broad. Endocarp perforate or imperforate, surface either rough all over, and dorsally bearing 4 longitudinal rows of 9–14 short papilliform tubercles (sometimes joined transversely) or surface smooth, and dorsally bearing 4 longitudinal rows of 9–10 T-shaped ridges.

Distribution. N. Guinea and Ceram (see Fig. 6), possibly also in Timor Laut and Solomon Isls. (San Cristoval).

Habitat. Occurring on sea-shore in Ceram ; in forests up to 1500 m. altitude in N. Guinea.

Fig. 6. Distribution of *St. zippeliana* Miq. (●), *St. moluccana* Forman (+) and *St. montana* Diels (×).

Note. There is a considerable variation in the appearance of the lower surface of the leaf. Some specimens have a fairly smooth lower surface with an indistinct, fine reticulation (e.g. *Brass* 5507, *Carr* 14663 and 15786, and *Clemens* 466). Other specimens (e.g. *Kanehira and Hatusima* 12569, *Kornassi* 880 and *Pleyte* 823) have a lower surface which is very prominently and densely reticulate, the veins having a curiously " exposed " appearance, as though the surface has been eaten by insects. This appearance is due to the thin plates of tissue which lie along the veins. In *Carr* 14115 and 15685, the lower surface is rather smooth but there are minute ridges on the epidermis in the " islands " surrounded by the fine veins. These variations at first suggested the presence of more than one species. Leaf samples of some of the above mentioned specimens were submitted to Dr. C. R. Metcalfe for detailed, microscopical examination. As a result he very kindly produced the report which appears after this paper. I am greatly indebted to Dr. Metcalfe for his observations, from which it appears that the different structures of the lower surface of the leaves of different specimens may possibly represent different developmental stages : the densely reticulate lower surfaces with prominently fluted veins are possibly developed from smooth lower surfaces with veins which are not obviously fluted. This question cannot be settled until material is available of a range of leaves at different stages of development from a single plant.

There may be more than one species included here, but the material examined was too incomplete to justify recognising more than one species. Very few open male flowers were found and only fragments of

the inflorescences were represented. No complete female flowers were found, but according to a note by Beccari on one sheet of his P.P. 664 at Florence, the petals and the sepals of the female flowers both number three.

Collections examined :—

? [Lesser Sunda Isls. : Timor Laut, Jamdena ; Mar. (♂), *Buwalda* 4341 (L)].

Moluccas.—Ceram : *Teysmann and de Vriese s.n.* 1859–60 (L). Tum ; Jan. (♂), *Kornassi* 880 (BO). ? [Kei Isls., *Jaheri* 357 (BO), and *Jaheri* 358 (BO, L—excl. folia).]

N. Guinea. *Chalmers s.n.* 1885 (L). *Zippelius* 18 (? 5)d (L *excl. folia*).—West N. Guinea : Andai ; (♂ and ♀ fl.), *Beccari* P.P. 664 (FI). Ansus ; Apr. (♀ fr.), *Beccari s.n.* 1875 (FI no. 681) FI). Nabire, Sennen ; Mar. (♀ fr.), *Kanehira and Hatusima* 12569 (BO). Carstensz Peaks ; Jan. (♂), *Kloss s.n.* 1913 (BM). Near Mamberamo ; July (st.), *Lam* 714 (BO, K, L). Misoöl Isl., Waigama ; Sept. (♀ fl.), *Pleyte* 823 (K, L, SING). Hellwig Mts. ; Oct. (♂), *von Romer* 630 (L).—East N. Guinea : Mafulu ; (♂), *Brass* 5507 (A, BO). Lala river ; Dec. (♂), *Carr* 14115 (A, BM, K, L, SING). *ibidem*, Feb. (♂), *Carr* 15685 (A, BM, K, L, SING). Boridi ; (♂), *Carr* 14242 and 14663 (A, BM, K, L, SING). Isuarava ; Jan. (♀ fr.), *Carr* 15786 (A, BM, K, L, SING). *ibidem* Mar. (♂), *Carr* 15876 (SING). Morobe District : Sattleberg ; Oct. (♂), *Clemens* 466 (A, L). Yunzaing ; July (♂), *Clemens* 3619 (A-*excl. folia*). *ibidem*, July (♀ fr.), *Clemens* 3804 (A). Boana, *Clemens* 41370 and 41759 (A). Sogeri Region, (♂), *Forbes* 873 (BM, L). Sepik, (♀ fr.), *Lederman* 6812 (K *parte*). ' Kaiser-Wilhelmsland ' ; Oct. (♂), *Schlechter* 18401 (P).

? [Solomon Isls., San Cristoval, Balego-Nagonago ; Sept. (♂), *Brass* 2828 (A)].

9. **Stephania moluccana** *Forman* sp. nov. a *St. montana* Diels inflorescentiis e cymis brevius ramosis compositis, foliis ovatis vel triangulari-ovatis acumine obtuse mucronulato differt.

Frutex scandens c. 6–8 m. altus, omnino glaber. *Folia* petiolis 3–5 cm. longis ; lamina ovata vel triangulari-ovata, 6–13 cm. longa et 4·5–8 cm. lata, apice breviter obtusa vel sensim angustata, acumine obtuse mucromulato, basi rotunda vel truncata, palmatim 9–13-nervis, utrinque laxe reticulata, chartacea. *Inflorescentiae masculae* e caulibus vetustioribus lignosis exortae, e cymis umbelliformibus 2–5 cm. longis in axe tenui 10–20 cm. longo laxe dispositis compositae ; cymae pedunculis tenuissimis 1–4 cm. longis et radiis primariis minus quam 1 cm. longis. *Flores masculi* pedicellis filiformibus c. 2 mm. longis ; sepala 6, late oblanceolata vel spathulata, 1·5–2 mm. longa et 0·75–1 mm. lata ; petala 3, obdeltoidea, 0·75 mm. longa et lata, carnosa ; synandrium 1 mm. longum. *Inflorescentiae foemineae* masculis similes sed minores, axe c. 7–13 cm. longo, e cymis 1·5–3 cm. longis compositae. *Flores foeminei* ignoti. *Fructus* (? immaturi) plerumque pedicellis usque 2 mm. longis vel interdum sessiles, ambitu rotundato-obovati, 5 mm. diametro. Endocarpium imperforatum dorso 4 seriebus 10–13 tuberculorum brevissimorum papilliformium ornatum.

Typus : Moluccas, Ternate, Foramadiah, *Beguin* 1462 (holotypus in BO !, isotypus in L !).

Distribution. Moluccas : Ternate and Morotai (see Fig. 6).

Habitat. *Beguin* 1462 from Ternate is recorded as being scattered in forests at ± 1000 m. altitude. *Kostermans* 839 from Morotai is recorded from forests at 30 m. altitude.

Notes. This species is most closely related to *St. montana* Diels, from which it differs mainly by its inflorescences, which are composed of shorter, more compactly branched cymes, and by its more ovate leaves with an obtusely mucronulate acumen.

Collections examined :—

Moluccas.—Morotai, Tjaw forest ; May (♂), *Kostermans* 839 (L).—Ternate : Nov. (st.), *Beccari s.n.*, FI no. 689 (FI). N. Foramadiahi ; Mar. (♂ and ♀ fr.), *Beguin* 1462 (BO, L).

Stephania montana *Diels* in Engl. Bot. Jahrb. **52,** 189 (1915).

Type : NE.N. Guinea, Sepik River, Hunstein range, *Ledermann* 11381 (holo. B !).

Measurements and descriptions in square brackets are taken from Diels' original description.

Slender climber. Stem glabrous. *Leaves* with glabrous petioles [3–] 4–6 cm. long, lamina triangular, [narrowly triangular] or subtriangular, (6–) 9–12 [–14] by 5–9 cm. ; apex very acute, finely apiculate ; base truncate to slightly rotund, sometimes apiculate at the basal corners ; palmately 9–11-nerved ; both surfaces glabrous, [lower surface sometimes strigulose on the nerves] ; chartaceous. *Male inflorescence* arising from leafless parts of the stem, very lax and slender, glabrous or papillose, composed of umbelliform cymes 4–14 cm. long with primary umbel-rays mostly more than 1 cm. long, peduncles of cymes slender, 3·5–8 cm. long arranged alternately along a slender axis about 40–50 cm. long. *Male flowers* white or cream with pedicels up to about 3 mm. long ; sepals 6, obovate, 1·5 mm. long, glabrous ; petals ? 3, ± broadly obovate, 0·75 mm. long, glabrous. *Female inflorescence* similar to male but more compact, with the peduncles of the cymes 1–2 cm. long. *Female flowers* unknown. *Fruits* with pedicels 5–10 mm. long, rotund-obovate in outline, 5–6 mm. long, 4–5 mm. broad. Endocarp ? perforate, dorsally bearing 4 longitudinal rows of 12–16 ± papilliform tubercles.

Distribution. East New Guinea (see Fig. 6).

Habitat. Recorded from mossy forests at altitudes between 1300 m. and 2070 m.

Notes. The material I have seen of this species is incomplete. The type specimen has only one leaf and a few flower buds. Fruits are known only from the specimen of *Carr* 14221 in the British Museum, and these are possibly immature. Nevertheless, the species appears to be distinct on account of its triangular leaves and long, slenderly branched and lax inflorescences. Only on the leaf of the type specimen are the basal corners of the lamina apiculate.

Collections examined :—

N. Guinea.—Papua : Alola ; Dec. (♂), *Carr* 14044 (BM, K, L, SING). Boridi ; Sept. (♂ and ♀ fr.), *Carr* 14221 (BM, L, SING).—NE. N. Guinea, Sepik R., Hunstein range ; Mar. (♂), *Ledermann* 11381 (B).

Flowers in Colour.—*This is one of the most attractive books on gardening published recently.

In simple language, set in good type, the author supplies useful information on more than a thousand species of the most popular and colourful garden plants. Short but important notes are given on the type of soil required, propagation and treatment, size, time of blooming, colour and quantity of bloom.

Of each genus at least one species is illustrated in colour by Miss Cynthia Newsome-Taylor. The quality of these illustrations is excellent. In addition there are nearly 500 line illustrations taken from those originally drawn by J. de C. Sowerby for J. C. Loudon's ' Encyclopaedia of Plants ' in 1829. These engravings, set in the margins beside the text, have been enlarged to one and a half times the size of the originals and are both accurate and attractive.

A useful index of popular names is included in the book which will be a constant source of delight to all garden lovers.

H. S. Marshall.

* Flowers in colour : an amateur gardening encyclopaedia. By A. G. L. Hellyer. Pp. 128. Illus. London, 1955. W. H. & L. Collingridge. Price 21s.

Dried Flowers for Decoration.*—Flower arrangement in all its aspects is a subject which has become increasingly popular in recent years. During the summer months it is an easy matter to indulge an interest in the subject but in winter fresh material is scarce. The use of dried plants for decoration then becomes of special interest. The writer of this book deals first with the immortelles or true everlastings and other flowers that will dry satisfactorily. Other chapters are devoted to such subjects as foliage and ferns : grasses and sedges : seed-heads and flower skeletons : nuts, fruits and cones : bark branches, lichens and fungi. The concluding chapters deal with colour and design, assembly, and arrangement. Both the professional and the amateur may find useful hints in this book on the decorative uses of dried plants.

B. J. Youngman.

* Dried Flowers for Decoration. By Violet Stevenson. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1955, pp. 87, 21 line drawings and 29 photographs. Price 15/-.

PAPILLAE AND FLUTED VEINS ON THE ABAXIAL LEAF SURFACE OF STEPHANIA ZIPPELIANA MIQ. (MENISPERMACEAE).

C. R. METCALFE

While examining the leaves of certain specimens of *Stephania* from New Guinea, Mr. Forman* noted a considerable variation in the appearance of the abaxial surface of the leaves of *S. zippeliana* Miq. Under the lens these differences appeared as variations in " texture ", but, as their true nature was not immediately apparent, it seemed desirable to examine the leaves more thoroughly at a higher magnification. The outcome of this investigation is embodied in the following note.

The course of the vascular bundles in the leaves from all of the specimens that were examined can be seen very clearly because the veins project from the abaxial surface. Furthermore, if the abaxial epidermis is removed from the leaves and mounted for examination in surface view, the course of the bundles is still apparent because some of the sclereids that accompany the vascular bundles remain attached to the epidermis, where they are very conspicuous objects under the microscope because they are much more opaque than the very thin-walled, transparent cells of the epidermis that lie above them. Surface-view preparations show clearly that the vascular system is fundamentally a closed network, of which the meshes represent the intercostal areas of the epidermis, appearing as " islands " of which each is surrounded by sclereids. In some specimens, e.g. *Brass* 5507, the vein system is so completely closed that very few of even the finest veins end blindly in the mesophyll. In other specimens, however, such as *Kanehira and Hatusima* 12569, quite a high proportion of the fine veins end blindly in the mesophyll, so that there is a contrast in the vein system of this specimen as compared with that in *Brass* 5507. It is quite probable that the blind endings of the fine veins represent transverse fractures that occur during the development of the leaf. Recent studies on the development of leaves indicate that vein endings do sometimes arise in this way.

Another important structural variation concerns the surface of the veins. In *Brass* 5507 the very thin-walled epidermal cells above, and immediately on either side of, each vein are much longer in a direction at right angles to the course of the veins than in the directions in which the courses of the veins lie. By careful focussing, the epidermal cells, many of which are more or less rectangular in shape, can be seen lying above and very markedly at right angles to the sclereids that accompany the veins. The epidermal cells on either side of the veins are more definitely rectangular than are some of those immediately above the veins, so that the marked contrast between the epidermal cells and the underlying sclereids can often be seen more easily beside than above the veins. The long axes of some of the epidermal cells, which lie at right angles to the veins, are often as much as 40 μ in length, whereas the short axes of the same epidermal cells, which lie parallel to the veins, are only 12 μ long.

The opposite extreme in the appearance of the surface of the veins is shown by *Kanehira and Hatusima* 12569, where the veins have a fluted appearance because they are provided with longitudinal ribs. These ribs, which consist of very thin plates of epidermal cells, are not immed-

* p. 67 this part.

iately recognisable in herbarium specimens because they are so easily flattened, but in revived material they can be seen quite easily. The cells forming the plate-like ribs are elongated at right angles to the course of the veins, and in some places the cells composing the ribs appear to have become divided by one or two transverse walls. Since the ribs stand out from the surface of the veins, it follows that they themselves are shown in section in a transverse section through the lamina. The ribs, in section, have the appearance of epidermal papillae of various lengths, the longer ones being transversely septate. It is only in preparations showing the surface view of the abaxial epidermis that the plate-like nature of the ribs becomes apparent. The ribs in a leaf from Kanehira and Hatusima's specimen are mostly 44–64μ tall, and some of them may be even longer. Similar plate-like ribs were not observed in *Brass* 5507, although a few papillae about 16–20μ tall were noted on the surfaces of some of the larger veins of this specimen.

For the complete understanding of the differences in the appearance of the surfaces of the leaves from different specimens of *Stephania zippeliana* it must next be noted that the intercostal " islands " are densely covered with epidermal papillae, and that the papillae vary considerably in length. The intercostal papillae are so numerous that it is often difficult to observe the stomata that lie between them at their bases. Nevertheless, in suitably cleared preparations, the stomata can be seen by careful focussing. Intercostal papillae in transverse sections of the leaf of *Brass* 5507 were mostly about 20μ high, but they range from 16–28μ. They stand out in marked contrast to the non-papillose epidermal cells which are 8–10μ tall, or rather taller over the more prominent veins. The papillae in *Kanehira and Hatusima* 12569 range from 12–44μ in height, many of them being 20–44μ tall, i.e. about twice as long as the corresponding papillae in *Brass* 5507.

The above description applies particularly to *Brass* 5507 and *Kanehira and Hatusima* 12569, and special attention has been devoted to these two specimens because they show very different types of leaf surfaces. It may be noted, however, that *Carr* 15685 showed a type of structure similar to that of *Brass* 5507. *Pleyte* 823 exhibited fluted veins similar to those in *Kanehira and Hatusima* 12569, the ribs, some of which are 2–3 cells high, being 48–112μ tall. In this specimen, however, the intercostal papillae are less frequent than those in the other 3 specimens that were examined, those that were measured being 12–36μ tall.

In interpreting these observations, it should be noted that leaves in which a fairly high proportion of the veins end blindly in the mesophyll are also those in which the plate-like ribs that give the veins a fluted appearance are well developed. It has already been indicated that the blind endings of the veins may arise by the transverse fracture of the smaller veins during the development of the leaf. If this is so, it seems quite possible that the fluting of the veins by the development of ribs is also secondary.

It is, however, quite impossible to make a final pronouncement on this subject without having access to a much greater range of material, including leaves at different stages of development from a single plant. At first sight, however, it would appear to be inadvisable to use differences in the papillae and fluting of veins as taxonomic criteria without further investigation.

NOTES ON CYPERACEAE : XXXIX.*

E. Nelmes

African Species of Scleria excluding Sect. Hypoporum.

Here is completed the account of the genus *Scleria* in Africa, the other part of which was published in the Kew Bulletin in 1955 (Notes on Cyperaceae, XXXVIII).

A generic description and a key to the Sections are given below and short descriptions of the Sections appear at the appropriate places in the work. There are also artificial keys to the species in Sections *Ophryoscleria* and *Scleria* (Sect. *Schizolepis* contains only one African species, and a key to the species of Sect. *Hypoporum* appeared in the earlier work).

In this part of the genus, comprising Sections *Schizolepis*, *Ophryoscleria* and *Scleria*, the inconstancy of the surface characters of the achene found in several species of Sect. *Hypoporum* is almost absent. There is a curious character in the wide leaves of species of Sect. *Schizolepis* and Sect. *Ophryoscleria*. Towards the apex of the leaf there is sometimes a sudden narrowing, usually asymmetrical (occurring at not quite opposite points on the margins), so that both lateral sides of the leaf, between each margin and the first principal nerve, end abruptly. Below this narrowing there are five principal nerves and above it three. Some students of the genus, including C. B. Clarke, have applied the term "*praemorse*", meaning "bitten off", to this character, but it does not seem quite appropriate.

It does not seem necessary to repeat here notes of a general character, already dealt with adequately by authors such as Core and Piérart, on the distribution and other features of this pan-tropical genus.

In the other part of my study of *Scleria* some remarks were ventured on the possible evolution of Sect. *Hypoporum* in relation to that of the other sections of the genus. I have resisted the temptation to add to those remarks here, especially having regard to the need for further comparative morphological study of the inflorescence in *Scleria* and related genera.

Scleria *Berg.*
in
Vet. Akad. Handl. Stockholm, 26 : 142 (1765).

Perennial and *annual herbs*, rarely lianiform, with short, elongated or creeping *rhizomes*. *Stems* more or less trigonous or triquetrous, nodose, mostly erect. *Leaves* narrowly to widely linear to oblong, the latter sometimes narrowing above, situated in the lower part of the stem, or throughout and merging above into the leafy bracts, leaves and bracts sheathing the stem, smooth or scabrid on the margins and on the 1-5, usually 3, principal nerves, glabrous or villous on the surface, lower reduced to short-bladed sheaths ; *sheaths* closed, sometimes winged, terminated above, behind the stem, by a ligular zone, not or scarcely developed into a ligule proper, apex of the sheath in front truncate or produced into a tongue, or pseudo-ligule. *Spikelets* in terminal and

* Continued from K.B. 1955 : 453 (1955).

lateral panicles arising from the sheaths of leafy bracts, or borne in terminal glomerate-spicate ebracteate inflorescences, either androgynaeceous and male, or female and male, in an inflorescence, the androgynaeceous spikelets composed of one basal female flower and 1-several upper male flowers, the female ones with one basal female flower and 1–2 empty glumes, and the male spikelet similar to the androgynaeceous one but without the basal female flower and often with more numerous male flowers. *Flowers* unisexual, solitary in the axils of spirally arranged *glumes*, of which the lower 2–4 are empty. *Male flower* consisting of 1–3 stamens ; anthers linear, often apiculate to aristate. *Female flower* a pistil of 2–3 carpels, and 1 linear *style* which is continuous with the *ovary*, rarely persistent, branched above into 3 stigmas. *Achene* usually ovoid, ellipsoid, or subglobose, obscurely or obtusely trigonous, bony or crustaceous, often white and shining, smooth, reticulate, muricate, verrucose, tuberculate or tessellate, glabrous or hairy, borne on a gynophore which is often dilated at the apex into a triangular, trilobed or cup-like disc known as the *hypogynium*.

This description will probably need some modification when comparative study is made of allied genera.

Key to the Sections of African Species of *Scleria*.

Inflorescence terminal, glomerate-spicate ; bracts 0 (except in *S. lithosperma*) ; spikelets androgynaeceous and male ; hypogynium scarcely developed . . . . . 4. *Hypoporum*

Inflorescence in terminal and axillary panicles ; bracts leafy (except in *S. poaeformis*) ; spikelets female and male ; hypogynium well developed :

Hypogynium margin smooth and entire . . . . . 3. *Scleria*

Hypogynium margin fimbriate or ciliate :

Margin of hypogynium fimbriate ; style-base not persistent 1. *Schizolepis*

Margin of hypogynium ciliate ; style-base persistent 2. *Ophryoscleria*

Sect. 1. **Schizolepis** (*Nees*) *C. B. Clarke* in Hook. f., Fl. Brit. Ind. 6 : 694 (1894).

Schizolepis Nees in Mart., Fl. Bras. 2 (1) : 186 (1842).

Stout plants with wide *leaves* which are sometimes suddenly narrowed above. *Spikelets* female and male, in terminal and lateral panicles. *Bracts* leafy. *Hypogynium* trilobed, fimbriate on the margin. *Style-base* not persistent.

1. **Scleria angusta** *Nees ex Kunth*, Enum. Pl. 346 (1837) ; C. B. Clarke in Dyer, Fl. Cap. 7 : 296 (1898) ; Cherm. in Arch. Bot. Caen, 7, Mém. 2 : 97 (1936).—South Africa, *Drège* 4246.

A rather stout and very tall perennial with rather numerous panicles and a stout elongated or creeping rhizome, which is 4–6 mm. thick.

Stems up to 250 cm. tall, 4–6 mm. thick below, smooth below, often hairy above especially just below the nodes and on the rhachis where the angles are also usually hispidulous. *Leaves* spaced throughout the middle part of the stem up to the bracts, long but not usually exceeding the stem, up to 16 mm. wide, flat to strongly plicate-revolute, smooth below, scabrid above on the margins and principal nerves, lower reduced to reddish or vinaceous sheaths ; *sheaths* acutely angled but not or scarcely winged, smooth, glabrous, or sometimes villous-hispidulous, especially below the mouth which is produced into a rounded-deltoid tongue 2 5 mm. long. *Panicles* 4–7, single at nodes, 3–6 cm. long, 2 -5 cm. broad, subdense, pyramidal to elliptic in outline, branches and spikelets obliquely to patently spreading, on peduncles scarcely to shortly or sometimes rather longly exserted from the bract-sheaths. *Bracts* exceeded by or exceeding the apex of the stem ; *sheaths* similar to but more frequently villous than the leaf-sheaths. *Male spikelets* 3·5–4 mm. long. *Female glumes* widely ovate, apex acute to obtuse, 2·75–3·5 mm. long, glabrous or nearly so, palish with reddish-brown streaks, margins sometimes minutely ciliolate in places, usually mucronate. *Achene* ovoid or ellipsoid-ovoid, obsoletely trigonous, 2·25 3·25 mm. long, 1·9–2·5 mm. broad, smooth and glabrous, white, sometimes violet tinged above, disc shortly trilobed, lobes sub-orbicular to ovate-oblong with a rounded apex, margins of lobes fimbriate.

Zululand : Ungoya forest, in swamp, 6 May 1887, *Wood* 3863 (K).

Natal : Utrecht, 2 Aug. 1934, *Pole-Evans* 3562 (K) (probably this species : no flowers or fruits).

Pondoland or Natal : between the Umtentu and Umzimkulu rivers, below 150 m. Feb. 1840, *Drège* 4246 (K).

Madagascar.

This is the only member of Sect. *Schizolepis* known from the mainland of Africa. There are several others in Madagascar and a larger number in Tropical America.

Sect. 2. **Ophryoscleria** (*Nees*) *C. B. Clarke* in Urban, Symb. Antill. 2 : 138 (1900).

Ophryoscleria Nees in Mart., Fl. Bras. 2 (1) : 182 (1840).

Stout plants with wide *leaves* sometimes suddenly narrowed above. *Spikelets* female and male, in terminal and lateral panicles. *Bracts* leafy. *Hypogynium* a cupule, ciliate on the margin. *Style*-base persistent.

Achene verrucose :

Leaves 1–3 cm. wide ; male spikelets 4–5·5 mm. long ; achene 4–6 mm. long, sparsely verrucose . . . . . 5. *S. verrucosa*

Leaves 8–14 mm. wide ; male spikelets 2·25–3 mm. long ; achene 2–2·5 mm. long, extremely sparsely verrucose . 6. *S. oligochondra*

Achene smooth :

Achene extremely compressed, with a circular groove above the middle, 4·5–6 mm. broad . . . . . 3. *S. depressa*

Achene not compressed and not grooved, 2·5–4·5 mm. broad :

Female glumes 4–5 mm. long ; achene usually ovoid, 5–7 mm. long, 3–4·5 mm. broad . . . . . 2. *S. racemosa*

Female glumes 3–4·5 mm. long ; achene more or less globose, 3·75–4 mm. long, 2·5–3·5 mm. broad . . . . 4. *S. vogelii*

2. **Scleria racemosa** Poir. in Lam., Encycl. 7 : 6 (1806) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 508 (1902) ; C. B. Clarke, Illustr. Cyper., t. 131, fig. 5 (1909) ; Cherm., Fl. Madag., Cyper. 261 (1937) ; Piérart in Lejeunia, Mém. 13 : 58, t. 3, fig. 11, 12 et t. 5, fig. 3 (1953).—Madagascar, *Du Petit-Thouars*.

Scleria ciliolata Boeck. in Flora, 65 : 31 (1882). –Madagascar, *Hildebrandt* 2921.

A very tall and stout perennial with large, fairly smooth achenes, and a creeping rhizome, which is 5–8 mm. thick, and clothed with dark reddish-brown sheathing scales. *Stems* 90–350 cm. tall, 5–8 mm. thick below, smooth throughout, or only below, when the angles above are sparsely scabrid and the axes of the inflorescence more or less densely scaberulous-hispidulous. *Leaves* spaced through the middle part of the stem up to the bracts, not or not much overtopping the stems, 1·5–3·5 cm. wide, flat or flattish or more or less plicate-revolute, smooth below, scabrid on the margins and on the principal nerves above, lower reduced to almost bladeless and more or less reddish-brown sheaths ; *sheaths* scabrid on the margins of at least the wider wings, otherwise smooth, glabrous, or sometimes hispidulous downwards from the mouth, which is produced into a deltoid tongue 3–10 mm. long. *Panicles* 3–5, single at nodes, except that the lowest branch sometimes seems to be on its own peduncle, 3–11 cm. long, 1·5–6 cm. broad, subdense, oblong to elliptic or lanceolate in outline, branches and spikes mostly obliquely spreading, on peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* mostly reaching up to or overtopping the stem ; *sheaths* not winged or more narrowly winged, smaller, tighter, and tongue smaller, than in the leaf-sheaths. *Male spikelets* 4·5–6·5 mm. long. *Female glumes* very widely ovate, deeply cymbiform, apex rounded, 4–5 mm. long, glabrous to densely scurfy-hispidulous, light brown with dark brown flecks, margins ciliolate above, usually mucronate. *Achene* usually ovoid, sometimes ovoid-globose, or even subglobose, sometimes more suddenly narrowing towards the apex, 5–7 mm. long (including cupule), 3–4·5 mm. broad, sometimes slightly wrinkled, becoming smooth, glabrous, whitish to dark olivaceous, disc in the form of a fairly smooth to wrinkled or undulate, yellowish to orange, white- or yellowish-ciliate-margined, scarcely or slightly trilobed cupule 1·5–3 mm. long.

Belgian Congo : Congo River, Sept. 1863, *Burton* (K) ; Katanga, near Elizabethville, 1911, *Homblé* (K) ; Kasai, Mpie, April 1914, *Vanderyst* (K) ; 28 May 1914, *Vanderyst* 4184 (K) ; ibid., Hemptinne-St. Benoit, 1930, *Vanderyst* 23663 (K) ; Dilolo, in shade of R. Luan, 1932, *Young* 144 (BM) ; Yangambi, ± 470 m., June 1936, *Louis* 2281 (K) ; Mayumbe, Luki, 14 Feb. 1947, *Devred* 3201 (K) ; Lower Congo, Mvuazi, 21 Oct. 1947, *Devred* 18 (K) ; Uele, P. N. Garamba, central part, about 30 km., in *Papyrus* swamp, 700–800 m., 19 Feb. 1952, *Troupin* 84 (K).

Anglo-Egyptian Sudan : Madi, by the side of a stream, 1860–63, *Speke & Grant* (K) ; Bahr el Ghazal, Genena, 3 April 1869, *Schweinfurth* 1353 (K) ; Mongalla Province;

Valley of R. Yei near source, south of road, riverine forest, ± 900—1200 m., 28 Feb. 1934, *Dandy* 549 (BM) ; Yei, Kagelu station, Kagelu Khor, edge of water in open near forest, occasional, 21 Sept. 1937, *Myers* 7750 (K) ; N.W. Equatorial Province, Boro River Headwaters, 25 Jan. 1939, *Hoyle* 531 (BM) ; Yei District, Khor, near Haggar's Plantation, abundant, 12 May 1939, *Andrews* A1146 (K) ; Khor Aba, damp clearing in forest, 13 May 1939, *Andrews* A1207 (K).

Uganda : Entebbe ; lake shore forest, common, 1170 m., 1901, *Mahon* 4 (K) ; Kirema, swamp edge, 1200 m., 24 Aug. 1913, *Dümmer* 169 (K) ; Entebbe, 1160 m., Aug. 1922, *Maitland* 87 (K) ; ibid., lake shore, swampy part, 1150 m., Feb. 1923, *Maitland* 630 (K) ; Mile 10 on Entebbe Road, near large ditch running into swamp, 1170 m., June 1937, *Chandler* 1686 (K) ; N. Kigezi, Malamagambo Forest, 1050 m., Feb. 1950, *Purseglove* 3283 (K) ; and 3 other gatherings in the Kew herbarium.

Kenya : Kwale District ; Pengo forest, Shimba hills, 9 miles south-west of Kwale, 330 m., damp shady valley bottom, on dry mud area, 9 Feb. 1953, *Drummond & Hemsley* 1184 (K).

Tanganyika : Morogoro District ; Kibambawe, ± 780 m., Sept. 1930, *Haarer* 1850 (K) ; ibid., Kimbora Forest Reserve, river sides, very common, July 1952, *Semsei* S802 (K) ; Lindi District ; Lake Lutamba, 40 km. west of Lindi, 200–250 m., near banks, common, 29 Nov. 1934, *Schlieben* 5655 (BM) ; Mafia Island ; Kerongwe, margins of fresh-water ponds, 9 m. alt., 26 Aug. 1937, *Greenway* 5167 (K) ; and 2 other gatherings at Kew.

Zanzibar : *Stuhlmann* (BM) ; Sept. 1873, *Kirk* (K) ; July 1874, *Hildebrandt* 1350 (BM) ; Kinyasini, in wet situations, 21 Jan. 1929, *Greenway* 1121 (K) ; 1931, *Vaughan* 1383 (K) ; Mt. Kitope, damp ground, 7 Jan. 1933, *Vaughan* 2044 (BM).

Pemba : Weti, in swamps, Feb. 1928, *Vaughan* 282 (BM) ; *Vaughan* 623 (K).

Nyasaland : Songue to Karonga, North Nyassa, 510–600 m., July 1896, *Whyte* 37 (K) ; Namasi [received at Kew 5 Dec. 1898], *Cameron* 4 (K) ; Mt. Zomba, 1901, *Purves* 102 (K) ; Chia area, Kota-kota District, moist banks of waterholes, in large clumps, 480 m., 5 Sept. 1946, *Brass* 17533 (K) ; Yembe, Karonga, in evergreen forest, relict with numerous palms, 27 June 1951, *G. Jackson* 553 (K).

Northern Rhodesia : Hunzemfwa to Ngimba River, 25 Aug. 1929, *Burtt Davy* 20913 (K) ; Solwezi District ; R. Meheba, damp shady ground by river, 21 July 1930, *Milne-Redhead* 741 (K) ; Abercorn District ; near Kapata, among tall grasses in deep red soil on banks of Lunzua River, + 750 m., 18 April 1950, *Bullock* 2875 (K) ; Walamba, 22 May 1954, *Fanshawe* 1219 (K) ; in damp muddy bed of Inono stream, ¼ mile from Mpulungu Road, 1200 m., 5 Oct. 1954, *Mrs. H. M. Richards* 1948 (K).

Angola : Golungo Alto ; Poco ian Zambi, marshes on the banks of the river Cuango near Sange, Dec. 1854 and July 1855, *Welwitsch* 7128 (BM, LISU). Cuanza Norte ; Cazengo, July 1911, *Gossweiler* 5031, 5031a (LISU) ; Lunda ; Dundo, near the river Luachimo, riverine forest, 750 m., 19 July 1949, *Fontinha* 14266 (BM).

Madagascar.

Scleria racemosa is very closely related to the American *S. macrophylla*, which occurs " from Mexico to Brazil and Bolivia " (Core). It differs in having up to slightly narrower leaves, longer male spikes, and a longer, usually ovoid achene (the achene of *S. macrophylla* is subglobose-ellipsoid).

3. **Scleria depressa** (*C. B. Clarke*) *Nelmes* in Amer. Journ. Bot. 39 : 392 (1952).

S. racemosa var. *depressa* C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 508 (1902) ; Piérart in Lejeunia, Mém. 13 : 60 (1953).—Various West African specimens cited of which I choose *Michelin*, Senegal, as lectotype.

A very tall and stout perennial with large smooth achenes and a creeping rhizome, which is 4–6 mm. thick and clothed with vinaceous, becoming blackish, sheathing scales. *Stems* 100 270 cm. tall, 5–10 mm. thick below, from fairly smooth throughout, including the main axis of the inflorescence, to sparsely scabrid on the angles from near the base upwards, rarely minutely scurfy-hispid on the sides below. *Leaves* spaced throughout the middle part of the stem up to the bracts, mostly failing to reach the apex of the stem, 1·5–3 cm. or more wide, flat or

flattish to plicate-revolute, smooth below, scabrid on the margins and the principal nerves above, lower reduced to bladeless and dark reddish-brown sheaths ; *sheaths* scabrid on the margins of at least the wider wings, otherwise smooth, glabrous or sometimes minutely scurfy-hispidulous near the mouth, which is produced into a deltoid tongue 2–8 mm. long. *Panicles* 3 5, single at nodes except that the lowest branch is often on its own peduncle, 3–12 cm. long, 1–7 cm. broad, subdense, oblong to elliptic or lanceolate in outline, branches and spikes mostly obliquely spreading, on peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* shorter to longer than the whole inflorescence, upper reduced ; *sheaths* smaller, tighter, and less winged than the leaf-sheaths. *Male spikelets* 5–6 mm. long. *Female glumes* very widely ovate, deeply cymbiform, apex rounded, 5 6 mm. long, glabrous to densely scurfy-hispidulous, light brown with dark brown flecks above or throughout, margins above or only at apex ciliolate, mucronate. *Achene* extremely depressed-globose, constricted into a circular groove near the slightly hollowed summit, 4–5 mm. long (including cupule), 4·5–6 mm. broad (excluding cupule), smooth and glabrous, whitish or olivaceous, disc in the form of a smooth, wrinkled or undulate, yellowish or fulvous, white- or yellowish-ciliate-margined cupule 1–2 mm. long. *Style* situated in the hollowed apex of the achene.

Senegal : 1828, *Michelin* (K) ; on the shore, 1837, *Heudelot* 368 (K) ; Casamance, Sedhiou, Feb. 1900, *Chevalier* 2449 (K).

Gambia : *Ingram* (K).

French Guinea : 1906, *Farmer* 243 (K).

Sierra Leone : Jigaya, 330 m., 28 Sept. 1914, *N. W. Thomas* 2504 (K), and 3 other *Thomas* numbers from Sierra Leone at Kew ; Gorahun, " common marsh sedge ", 21 Nov. 1926, *Deighton* 353 (K).

Liberia : There are 7 Liberian gatherings of this species in the Kew Herbarium, all collected by J. T. Baldwin, Jr., and cited in Amer. Journ. Bot. 39 : 392 (1952).

Gold Coast : Pokoase, 15 miles north of Accra, secondary forest, April 1931, *Irvine* 1585 (K).

Nigeria : Nupe, in shady ravines, 1858, *Barter* 921 (K) ; N. Nigeria, Kontagora, ravines, 24 Nov. 1905, *Dalziel* 237 (K) ; 1908 ?, *Parsons* (K) ; 1930, *Thornevill* 98 (K) ; Abeokuta Province, Egba District, Olokemeji Teak Plantation, opposite Railway Station, marshy ground in overflow area of small stream, forming a small pure community, permanently in water, 7 Nov. 1944, *Onochie* (FHI 8130) (K) ; Zaria Province ; Anara F.R., Kan Gimi, by water in Bahago stream, beneath low forest shade, 29 Nov. 1946, *Keay* (FHI 21687) (BM) ; Kano Province, Tudunwadu District, Kogin Kano F/R, on the bank of the Kunbo Stream, 3 March 1948, *Onwudinjoh* (FHI 22355) (K) ; Kaduna Division, shady side of dried-up stream on Zaria Road about 6 miles north of Kaduna, 8 Dec. 1949, *Meikle* 760 (K).

British Cameroons : Adamawa Province ; Gashaka District ; Gangumi, about a chain north of Sulli river on Kwagiri footpath, high forest, 3 Dec. 1954, *Latilo & Daramola* (FHI 28800) (K).

Hutchinson, in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 493 (1936), identifies this species as " *S. racemosa* Poir. . . . . incl. var. *depressa* C. B. Cl.", and calls the figure of it on p. 492 " *Scleria racemosa* Poir."

4. **Scleria vogelii** *C. B. Clarke* in Dyer, Fl. Trop. Afr. 8 : 508 (1902) ; Hutch. in Hutch. & Dalz., Fl. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 60 (1953).—Various West African specimens cited of which I choose *Vogel* 59, Liberia, as lectotype.

A tall, robust perennial with comparatively small achenes and probably a stout creeping rhizome. *Stems* 90–240 cm. tall, 4–8 mm. thick

below, smooth below, more or less scabrid on the angles in places above, glabrous. *Leaves* spaced throughout the middle part of the stem up to the bracts, most, at least, falling short of the apex of the stem, 1·5–2 cm. wide, flat or flattish or more or less plicate-revolute, smooth below, scabrid on the margins and principal nerves above, lower probably reduced to almost bladeless sheaths ; *sheaths* fairly smooth, or slightly scabrid on the wings, which are narrow, glabrous or minutely hispidulous below the mouth, which is truncate or produced into a deltoid tongue up to 5 mm. long. *Panicles* 4–6, single except that the lowest branch seems to be on its own peduncle, 4–12 cm. long, 1–4·5 cm. broad, oblong to elliptic in outline, branches and spikes mostly obliquely spreading, on peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* most failing to reach but some a little overtopping the stem ; *sheaths* smaller and tighter than the leaf-sheaths, glabrous, angles acute. *Male spikelets* 4–5 mm. long. *Female glumes* very widely ovate, deeply cymbiform, apex rounded, 3–4·5 mm. long, glabrous, light to darker brown with still darker streaks and patches or nearly wholly dark brown, margins above ciliolate in places, mucronate. *Achene* subglobose, globose, or compressed-globose, 3·75–4 mm. long (including cupule), 2·5–3·5 mm. broad, smooth and glabrous, white, sometimes becoming dark olivaceous or brown flushed, disc in the form of a smooth to wrinkled or undulate, yellowish to brownish-orange, sometimes white- or yellowish-ciliate-margined, trilobed cupule, often becoming thickened, 1·5–2 mm. long.

Sierra Leone : *Smeathman* (BM).

Liberia : Grand Bassa Co. ; Grand Bassa, July 1841, *Vogel* 59 (K).

Nigeria : S. Nigeria ; Lagos [recd. at Kew Nov. 1894], *Millen* 154 (K) ; ibid., Ikoyi Plains, at edge of swamp forest, 11 June 1917, *Dalziel* 1301 (K).

British Cameroons : Buea, Bolifambi, a boggy or semi-aquatic plant, 750 m., March 1929, *Maitland* 553 (K).

French Cameroons : Batanga, damp places, 12 July 1895, *Bates* 317 (BM, K).

Gabon : Gabon River, July 1861, *Mann* 1023 (K) ; Libreville, *Debeaux* 189 (K).

Scleria vogelii has a very close affinity to the Central American and West Indies species, *S. eggersiana* Boeck. (*S. grisebachii* C. B. Clarke). The African plant has a much shorter tongue to the mouth of the leaf-sheath and a larger but slightly compressed achene, with a disc which is more distinctly lobed and much less densely ciliate on the margin.

Another close ally of *S. vogelii* is *S. sororia* (Nees) Kunth, which has a longer leaf-sheath tongue, shorter male spikelets, and a shorter achene. It is known only from its type locality in Brazil.

5. **Scleria verrucosa** *Willd.*, Sp. Pl. 4 : 313 (1805) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 509 (1902) ; C. B. Clarke, Illustr., t. 131, fig. 7 (1909) ; Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 61, t. 3, fig. 16, 17 (1953).—Guinea, no collection indicated.

Scleria spinulosa Boeck., Cyper. Nov. 2 : 30 (1890).—" E. Congo, *C. Smith*."

A very tall and robust perennial with rather large verrucose achenes and a creeping rhizome, which is 4–5·5 mm. thick and clothed with dark reddish or vinaceous sheathing scales. *Stems* 90–300 cm. tall, 4·5–9 mm. thick below, often coarsely but shortly hispidulous on the sides and

sparsely scabrid on the angles throughout, but sometimes so only above, being smooth and glabrous below. *Leaves* spaced throughout the middle part of the stem up to the bracts, not or not much overtopping the stems, 1–3 cm. wide, flat or flattish or more or less plicate-revolute, smooth below, scabrid on the margins and on the principal nerves above, glabrous or, sometimes, densely and stiffly but shortly hispidulous over both surfaces, lower reduced to almost bladeless and vinaceous sheaths ; *sheaths* scabrid on at least the wider wing-margins, otherwise smooth, glabrous or densely but shortly hispidulous, mouth subtruncate or produced into a deltoid tongue up to 6 mm. long. *Panicles* at 5–6 nodes, single except that the lowest branch seems to be on its own peduncle, 4–11 cm. long, 1–5 cm. broad, sublax to subdense, oblong to elliptic or lanceolate in outline, branches and spikes mostly obliquely spreading, on peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* from falling short of to somewhat overtopping the stem, upper much reduced ; *sheaths* not or more narrowly winged, smaller and tighter than in the leaf-sheaths. *Male spikelets* 4–5·5 mm. long. *Female glumes* very widely ovate, deeply cymbiform, apex rounded, 4–6 mm. long, usually glabrous, sometimes slightly scurfy-hispidulous, light to dark brown with still darker streaks and patches or nearly wholly dark brown, margins ciliolate above, strongly mucronate. *Achene* ovoid to subglobose, 4–6 mm. long (including cupule), 2·5–4 mm. broad, sparsely muricate-verrucose, often on longitudinal ridges, and with a few reddish deflexed bristles on the apices of the warts, glabrous, whitish or palish, disc in the form of a slightly lobed, smooth to wrinkled or undulate, yellowish to brownish-orange, somewhat thickened, usually whitish- or yellowish-ciliate-margined cupule, 1·5–2 mm. long.

Sierra Leone : Samu Country, marshes near sea, pretty common, 26–29 Dec. 1891, *Scott Elliot* 4218 (BM, K) ; 1915, *N. W. Thomas* 8692 (K) ; Njala, river-side, 13 Nov. 1929, *Deighton* 1777 (BM, K) ; near Topan (Kwako Krim), inland swamp, Feb. 1930, *Roadon* 11 (K) ; Kambia, Magbema, damp place by river Scarcies, 29 Dec. 1951, *Jordan* 762 (K).

Liberia : there are 19 gatherings of this species in the Kew Herbarium, mostly collected by J. T. Baldwin, Jr., and cited in Amer. Journ. Bot. 39 : 391–392 (1952).

Gold Coast : Akwapim (Aquapim), 1786, *Isert* 86 (C) ; Aburi, swampy places, 15 Oct. 1899, *Johnson* 232 (K) ; ibid., 18 Oct. 1899, *Johnson* 474 (K) ; Centr. Prov., Akroso, marshy areas, common, 18 Aug. 1925, *Howes* 953 (K) ; Abetifi, Kwahu, in undergrowth of secondary forest, 600 m., Jan. 1932, *Irvine* 1829 (K) ; Beposo Ferry (River Pra), in damp depression beside road, Dec. 1934, *Irvine* 2641 (K) ; Kwadass–Kumasi, 8 Aug. 1951, *Darko* 696 (K).

Nigeria : Lagos ; growing in swamp around Ebute Metta, Jan. 1893, *Millen* 94 (K) ; 3 to 4 miles north-west of Ibadan, 180 m., farm-land and round about compounds, Nov. 1936, *Newberry* & *Etim* 153 (K) ; Benin Province and Division, Okomu Forest Reserve, 19 Feb. 1948, *Onochie* 9077 (K) ; Bamenda Province ; Wum District, Nkom Wum, open grassland on level swamp, with *Alchonea cordifolia* and Elephant grasses. 3 July 1951, *Ujor* (FHI 29280) (K).

British Cameroons : Victoria, Missellele, aquatic plant, Jan. 1930, *Maitland* 901 (K).

French Cameroons : Yaúnde-Station, 800 m., 1890–94, *Zenker & Staudt* 535 (BM, K) ; Bifinde, March 1917, *Zenker* (C).

Belgian Congo : " E. Congo ", *C. Smith* (BM, C) ; Lower Congo ; above Stanley Pool, Sept. 1883, *H. H. Johnston* (K) ; Mokaba, 5 April 1914, *Vanderyst* 3842 (K) ; N.E. Congo ; Titule (Uele Itembiri), 1931, *Lebrun* 2715 (K) ; Semliki Valley, foot of escarpment, damp spots in gallery forests, 690 m., 10 Oct. 1935, *H. B. Johnston* 1206 (K) ; Central Congo Basin ; Likete on Lomela (Tshuapa), 15 June 1936, *Ghesquière* 2723 (K) ; Yangambi, June 1938, *Louis* 9809 (BM, K) ; ibid., July 1938, *Louis* 10220 (BM) ; Central Congo Basin ; river Lomia, Simbo to Yohuma (basin of the Lopori), 29 May 1954, *Germain* 8448 (K).

Uganda : Buganda Province ; Sese, Bugala, rain-forest, clay soil, rooting in water, common, 3 June 1932, *Thomas* 24 (K) ; ibid., Kyewaga Forest, N.-W. Victoria Region, Busiro County, swamp forest, 1125 m., 3 Sept. 1949, *Dawkins* 349 (BM, K).

Tanganyika : Bukoba District, Bushasha, swamp forest, 1935, *Gillman* 334 (K).

6. **Scleria oligochondra** *Nelmes*, sp. nov. ; affinis *S.verrucosae* Willd. sed foliis angustioribus, spicis masculis brevioribus, glumis femineis et achaeniis multo brevioribus, achaeniis parcissime verrucosis differt.—Belgian Congo, *Germain* 7422.

A tall but rather slender glabrous perennial with slender panicles and a longly creeping rhizome. *Rhizome* 2–3 mm. thick, clothed with dark reddish-brown sheathing scales. *Stems* 100–155 cm. tall, 3–3·5 mm. thick below, smooth and glabrous throughout, or sometimes very slightly scaberulous in places on the rhachis. *Leaves* subbasal and higher, sheathing much of the stem below the bracts, rather short, not extending to the apex of the stem, 8–14 mm. wide, flat or flattish, smooth below, scaberulous towards the apex, lower very short, lowest in the form of reddish sheaths ; *sheaths* smooth and glabrous except on the margins of its rather wide wings which are scaberulous in places, mouth produced into a deltoid (triangular) tongue up to 5 mm. long. *Panicles* 4–6, single at nodes, or lowest branch considered to be a second panicle, 4–10 cm. long, 1–2·25 cm. broad, loose, oblong to lanceolate in outline, branches and spikes suberect to obliquely spreading, on peduncles very shortly to rather longly exserted from the bract-sheaths. *Bracts* not exceeding the apex of the terminal panicle ; *sheaths* not winged, smooth, much smaller and tighter and tongue smaller than in the leaf-sheaths. *Male spikelets* 2·25–3 mm. long. *Female glumes* very widely ovate or suborbicular, apex rounded, 2·25–2·5 mm. long, glabrous, pale with fulvous streaks, margins above slightly ciliolate in places, mucronate, mucro and perhaps upper part of midrib minutely scurfy-hispidulous. *Achene* globose or ovoid-globose, 2–2·5 mm. long (including cupule), 1·75–2 mm. broad, very sparsely verrucose, with a few reddish deflexed bristles on the apices of the warts, glabrous, whitish or palish, disc in the form of a slightly lobed, wrinkled, deeply undulate or shrunken into cavities, light brownish, somewhat thickened, usually whitish- or yellowish-ciliate-margined cupule, 1–1·5 mm. long.

Belgian Congo : Central Congo Basin ; Ikela (Tshuapa), June 1952, *Germain* 7422 (BR, K). The Kew sheet is the holotype.

Sect. 3. **Scleria** (*Berg.*) *Endl.*, Gen. Pl. 112 (1836).

Scleria Berg. in Vet. Akad. Handl. Stockholm, 26 : 142 (1765).

Medium sized plants (except *S. poaeformis*) with leaves which are not suddenly narrowed above. *Spikelets* female and male, in terminal and lateral panicles. *Bracts* leafy (except in *S. poaeformis*). *Hypogynium* usually trilobed, smooth and glabrous on the margin.

A. Plants perennial, with a well developed and sometimes creeping rhizome :

1. Leaves 7–40 mm. wide ; panicle usually 1, terminal not with foliaceous bracts (achenes 3·5–3·75 mm. long, smooth, glabrous, white) . . . . . 32. *S. poaeformis*

1. Leaves 1–16 mm. wide ; panicles 2–5, 1–4 of which are lateral with foliaceous bracts :

2. Stems up to 9 m. tall, scrambling and climbing over bushes and small trees ; achene violaceous . . . . . 13. *S. barteri*

2. Stems not more than 2 m. tall, not scrambling nor climbing ; achene not usually violaceous :

3. Female glumes 7–11 mm. long ; achene 4–6 mm. long :

4. Leaves 10–16 mm. wide ; lateral panicles borne on 1–4 short to very long peduncles at each node . 10. *S. melanomphala*

4. Leaves 2–6 mm. wide ; lateral panicles borne on a single short peduncle at each node :

5. Stems 60–100 cm. tall ; leaf-sheaths vinaceous or dark reddish-brown ; spikelets widely spreading ; female glumes reddish-black or dark reddish-brown ; achene 4–5 mm. long . . . . . 17. *S. induta*

5. Stems 20–35 cm. tall ; leaf-sheaths yellowish to reddish ; spikelets not spreading ; female glumes pale with reddish streaks ; achene 5–6 mm. long . . . 18. *S. angolensis*

3. Female glumes 2·5–8 mm. long ; achene 1·3–4 mm. long :

6. Male spikelets more or less recurved ; achene distinctly longitudinally costate except the apex which is tubercled 21. *S. spiciformis*

6. Male spikelets not recurved ; achene not as that of *S. spiciformis* :

7. Achene bluish at the apex at least :

8. Apex of female glume recurved ; achene 2·25–2·5 mm. long, hairy . . . . . 12. *S. pterota*

8. Apex of female glume not recurved ; achene 2·5–4 mm. long, glabrous :

9. Male spikelets 4·5–6 mm. long ; achene dirty white to wholly bluish, 3–3·25 mm. long, disc not or scarcely lobed . . . . . 15. *S. baroni-clarkei*

9. Male spikelets 4–4·75 mm. long ; achene bluish only above, 3·25–4 mm. long, disc deeply lobed 14. *S. iostephana*

7. Achene not bluish :

10. Achene hairy :

11. Female glumes 4–5 mm. long ; achene 3–4 mm. long 7. *S. canaliculato-triquetra*

11. Female glumes 5–7 mm. long ; achene 2–3 mm. long 8. *S. nyasensis*

10. Achene glabrous :

12. Leaves 1–3 mm. wide ; achene 1·3–2·3 mm. long :

13. Female glumes villous ; achene oblong or oblong-obovoid, 1·3–2 mm. long, more or less verrucose-trabeculate . . 22. *S. bequaertii* var. *bequaertii*

13. Female glumes glabrous ; achene oblong or ellipsoid-oblong, 2–2·3 mm. long, smooth or nearly so . . . . . 22. *S. bequaertii* var. *laevis*

12. Leaves 2–10 mm. wide ; achene 2.5–4 mm. long :

14. Male spikelets 3–4 mm. long ; female glumes 2·5–3 mm. long . . . . 16. *S. naumanniana*

14. Male spikelets 5–10 mm. long ; female glumes 4–8 mm. long :

15. Leaves 7–10 mm. wide ; female glumes hispidulous ; achene 3–4 mm. long, smooth :

16. Male spikelets 7·5–10 mm. long ; female glumes about 8 mm. long ; achene cylindric or cylindric-ovoid, apex not beaked 11. *S. tisserantii*

16. Male spikelets 5–7 mm. long ; female glumes 4–5 mm. long ; achene ellipsoid or ellipsoid-globose, apex strongly beaked 20. *S. pachyrrhyncha*

15. Leaves 5–8 mm. wide ; female glumes glabrous; achene 2·5–3 mm. long, more or less lacunose or verrucose-muricate :

17. Female glumes 5–7 mm. long ; achene verrucose-muricate, disc orbicular, not or very shortly lobed . . . 19. *S. goossensii*

17. Female glumes 4–5 mm. long ; achene more or less lacunose, disc trilobed 9. *S. natalensis*

B. Plants apparently annual, with no or scarcely any rhizome :

18. Achene compressed-globose, broader than long, smooth and glabrous . . . . . 24. *S. schimperiana*

18. Achene not compressed-globose, longer than broad :

19. Leaves 1–2 mm. wide ; male spikelets about 3 mm. long ; achene smooth . . . . . 31. *S. gracillima*

19. Leaves 2–9 mm. wide ; male spikelets 3·5–6 mm. long ; achene not smooth but sometimes nearly smooth in *S. hildebrandtii* :

20. Achene glabrous :

21. Achene 2·25–2·5 mm. long, not or scarcely hairy but viscid on the often reddish apices of the walls of the lacunae 27. *S. mikawana*

21. Achene 3–4 mm. long, quite glabrous, lacunose walls not viscid :

22. Female glumes 3–5 mm. long ; achene ovoid, verrucose-lacunose . . . . . 23. *S. foliosa*

22. Female glumes 5–7 mm. long ; achene not ovoid nor verrucose-lacunose :

23. Panicles single at nodes, scarcely to rather shortly exserted from the bract-sheaths ; male spikelets 5–6 mm. long . . . . . 28. *S. tessellata*

23. Panicles single or binate at nodes, some on slender peduncles longly exserted from the bract-sheaths ; male spikelets 3·5–5 mm. long :

24. Male spikelets 4·5–5 mm. long ; achene 3·5–4 mm. long, nearly smooth to slightly alveolate, disc lobes reddish above and at the apex . 29. *S. hildebrandtii*

24. Male spikelets 3·5–4·5 mm. long ; achene 3–3·25 mm. long, longitudinally lacunose, disc lobes stramineous . . . . . 30. *S. clathrata*

20. Achene hairy :

25. Panicles single at nodes ; achene 3–3·5 mm. long, 2·75–3 mm. broad . . . . . 25. *S. globonux*

25. Panicles 1–3, or in 1–3 parts, at each node ; achene 2–3 mm. long, 1·5–2·2 mm. broad . . . . 26. *S. parvula*

7. **Scleria canaliculato-triquetra** *Boeck.* in Flora, 62 : 573 (1879) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 505 (1902) ; Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 48, t. 2, fig. 18–21 (1953).—Anglo-Egyptian Sudan, *Schweinfurth* 2474.

Scleria diurensis Boeck. in Flora, 62 : 573 (1879).—Anglo-Egyptian Sudan, *Schweinfurth* 2389, in part.

Scleria cervina Ridley in Trans. Linn. Soc., ser. 2, Bot. 2 : 171 (1884).—Angola, *Welwitsch* 7127.

Scleria vanderystii De Wild. in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 25, fig. 7 (1926)—Belgian Congo, *Vanderyst* 3471 and 4 other gatherings cited.

Scleria clathrata Hochst. ex A. Rich. var. *major* C. B. Clarke ex Cherm. in Archiv. Bot. Caen, 4, Mém. 7 : 48 (1931)—Ubangi-Shari, *Chevalier* 5903.

Scleria canaliculato-triquetra var. *clarkeana* Piérart in Lejeunia, Mem. 13 : 49, t. 2, fig. 20, 21 (1953).—Belgian Congo, etc., no type mentioned.

A robust or medium-sized almost glabrous perennial with a loose inflorescence which becomes rather dense, and a shortly creeping rhizome. *Rhizome* about 3–4 mm. thick, internodes very short, obscured by the thickened base of the stems. *Stems* up to about 2 m. tall, 3–4 mm. thick and sometimes smooth below, otherwise retrorsely scabrid on the angles, which are usually acute. *Leaves* not crowded at or near the base but spaced throughout the lower part of the stem, below the bracts, lower reduced to almost bladeless sheaths, long but not overtopping the stems, 5–12 mm. wide, flat to revolute, smooth below, usually scabrid above on the margins, on the under-surface midrib and the 2 prominent upper surface nerves, and sometimes rough over the whole upper surface towards the apex ; *sheaths* 3-winged, glabrous and smooth, or scaberulous on the wings, mouth usually produced into a short or rather long membranous tongue which is sometimes slightly villous at the apex. *Panicles* at 2–3 nodes, upper single, lower borne on 1–2 longly or very longly, often curved, glabrous and mostly smooth, trigonous or slightly compressed, unequally exserted peduncles, panicles 3–11 cm. long, 1–4 cm. broad, at nodes longly to very longly spaced from one another, becoming rather dense. *Bracts* shorter to longer than their panicles ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 5–6 mm. long. *Female glumes* ovate, ovate-acuminate or ovate-lanceolate, apex acuminate, 4–5, usually 5, mm. long, glabrous, usually with brown, reddish or vinaceous streaks or patches on a pale ground, sometimes wholly blackish-red, midrib usually excurrent in an awn up to 1 mm. long. *Achene* ovoid or cylindric-ovoid, 3–4 mm. long, 2·25–3 mm. broad, smooth to lightly alveolate or tessellate, with lines and tufts of subadpressed hairs, pale or whitish, very shortly beaked, disc deeply 3-lobed, the lobes narrowly lanceolate and acuminate and about 0·5–1 mm. long, stramineous.

French Guinea : Kouroussa, July 1900, *Pobéguin* 421 (K) ; ibid., Aug. 1900, *Pobéguin* 401 (K).

Sierra Leone : Njew (Mendi), Hill Station, side of ditch, 10 Oct. 1926, *Deighton* 2150 (BM, K) ; Northern Provinces, Makump, 22 Aug. 1928, *Deighton* 1357 (K) ; Tabe, wetter part of low grassfield, 21 Sept. 1935, *Deighton* 3040 (K) ; Falaba, grassland, 300 m., 4 Oct. 1951, *Small* 449 (K) ; near Kasenka (Majorki), weak sedge among thatch grass in *Lophira* bush, 24 Oct. 1951, *Jordan* 642 (K) (a very slender form).

Nigeria : Lagos, Abeokuta, *Irving* (K) ; N. Nigeria, Lokoja, 7 Sept. 1910, *Miss Macleod of Macleod* (BM) ; Katsina Allah, 19 June 1912, *Dalziel* 815 bis (K) ; Lagos, 16 Dec. 1927, *Hagerup* 782 (C) ; Onitsha Province ; Awka District, Mamu River F.R., near the savannah swamp below, 21 Sept. 1953, *Onochie* (FHI 34076) (K).

Ubangi-Shari : Haut-Oubangui ; basin of the Haute-Ombella, country of the Mbrous, Kaga Do, near Demba, 26 Oct. 1902, *Chevalier* 5903 (P) ; Moroubas, wooded scrub, 6 Aug. 1922, *Tisserant* 677 (P) ; marsh near Ippy, 25 June 1925, *Tisserant* 1950 (P) ; Zubingui, 25 km. south-west of Ippy, marsh near the river Baédou, 8 Aug. 1928, *Tisserant* 2636 (P).

Belgian Congo : Kisantu, 1900, *Gillet* 739 (BR) ; Wombali, Feb. 1914, *Vanderyst* 3471 (BR) ; Kasai, Kitebe, May 1914, *Vanderyst* 4112 (BR, K) ; Mboga, savannah, 18 June 1914, *Bequaert* 4802 (BR) ; Kivu, Rutshuru, steppe with *Andropogon*, 19 Oct. 1914, *Bequaert* 6050 (BR) ; ibid., Tuku Valley, grassy slopes, 1270 m., Dec. 1937, *Lebrum* 9093 (BR) ; Central Congo, Territoire d'Isangi, 29 June 1948, *Leonard* 1785 (BR, K) ; Lower Congo, Mvuazi (Station INEAC), grassy savannah, with *Hyparrhenia*, 20 May 1944, *Germain* 2257 (BR, K) ; grassy savannah, 19 Feb. 1948, *Devred* 77 (BR) ; Haut Lomani, Kamalenge, wooded savannah, 950 m., 10 March 1947, *Mullenders* 159 (BR) ; ibid., Kasenji, wooded savannah, 870 m., 15 May 1947, *Mullenders* 629 (BR) ; Urundi, Mosso, Kiofi, savannah, in soil periodically very wet and very dry, 26 Feb. 1952, *Michel & Reed* 1261 (BR) ; Uele, Garamba National Park, 700–800 m., shrubby savannah, 3 July 1952, *Troupin* 1384 (BR, K) ; ibid., 7 Aug. 1952, *Troupin* 1777 (BR, K) ; and 17 further gatherings (seen) in the Brussels Herbarium.

Anglo-Egyptian Sudan : Bahr el Ghazal Province, 17 Sept. 1869, *Schweinfurth* 2389, in part (K) ; ibid., 12 Oct. 1869, *Schweinfurth* 2474 (K) ; Equatorial Province ; Kagelu station, Yei, occasional among grasses on neglected fire break, 21 Sept. 1937, *Myers* 7744 (BR, K).

Uganda : grassy hillside above Mugamba, rare, 1200 m., June 1914, *Dümmer* 850 (BM, K) ; summit of Namingama Hill, among grass, 1290 m., Feb. 1916, *Dümmer* 2934 (BM).

Tanganyika : E. Usambaras ; grassy slopes of Mt. Lutindi, 800 m., 16 Aug. 1915, *Peter* 12939 (EA).

Nyasaland : Manganja Hills, near Mt. Sochi, 900 m., 8 March 1862, *Kirk* (K) ; Kondowe to Karonga, 600–1800 m., July 1896, *Whyte* (K) ; ibid., plains of Mt. Zomba, 750–900 m., Feb. 1897, *Whyte* (K).

Northern Rhodesia : Muckle Neuk, 12 miles north of Choma, Dambo, 1230 m., 14 Jan. 1954, *E. A. Robinson* 468 (K).

Angola : Pungo Andongo ; marshy places near Quibanga, Jan. 1857, *Welwitsch* 7126 (BM, LISU) ; ibid., spongy places between Mutollo and Candumba, March 1857, *Welwitsch* 7127 (BM, LISU).

The surface of the fruits of the specimens cited above seem to me to show a gradual gradation from lightly alveolate to smooth, and thus to render synonymous with the species Piérart's var. *clarkeana* which is described as differing from *S. canaliculato-triquetra* in its smooth fruits. With this supposed smooth-fruited variety Piérart associates " *S. canaliculato-triquetra* C. B. Clarke . . . . non Boeck.", but I believe that Clarke was thinking of the species in the broader sense in which I have treated it when he rather unprecisely described the fruits as smooth.

var. **adpresso-hirta** Kükenth. in Fedde, Repert, Beih. 40, 1, Anhang p. 142 (1938).—Tanganyika, *Peter* 38957a.

Whole *plant* more or less subadpressed-hairy. *Glumes* light ferrugineous. *Achene* ovoid, 3–3·5 mm. long, 2·5–2·6 mm. broad.

Tanganyika : Ujiji ; between Kandaga and Lake Tanganyika, 950 m., 21 March 1926, *Peter* 38957a (EA).

8. **Scleria nyasensis** *C. B. Clarke* in Dyer, Fl. Trop. Afr. 8 : 504 (1902) ; Piérart in Lejeunia, Mém. 13 : 45, t. 2, fig. 12 (1953).—Nyasaland, Mt. Zomba, *Whyte*.

Scleria achtenii De Wild. in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 16, fig. 1 (1926).—Belgian Congo, *Achten* 97A, 97B.

Scleria substriatoalveolata De Wild. in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 23, fig. 6 (1926).—Belgian Congo, *Vanderyst* 1060, 1890 and *sine num.*

Scleria subintegriloba De Wild., Pl. Bequaert. 4 : 238, fig. 7 (1927).—Belgian Congo, *Vanderyst* 2839.

Scleria achtenii var. *subintegriloba* (De Wild.) Piérart in Lejeunia, Mém. 13 : 47, t. 2, fig. 17 (1953).

Scleria elongata Piérart in Lejeunia, Mém. 13 : 45, t. 2, fig. 13 (1953), non Presl (1828).—Belgian Congo, *Duvigneaud* 691.

Scleria elongatissima Piérart in Lejeunia, Mém. 13, 68 (1953).—New name for *S. elongata* Piérart.

A tall and rather slender, nearly wholly glabrous perennial with lax to rather dense panicles, tufted stems, somewhat bulbous at the base, and a short rhizome. *Rhizome* shortly creeping, sometimes obscured by the bulbous base of the stems, 2·5–4 mm. thick. *Stems* 45–80 cm. tall,

1–2·5 mm. thick below, smooth and glabrous throughout or sometimes scabrid above on the angles and occasionally villous-hispidulous on the sides. *Leaves* mostly subbasal but occupying and sheathing the lower half or more of the stem, shorter than the stems, 3–8 mm. wide, flattish to revolute, involute or conduplicate, sometimes smooth and glabrous throughout, sometimes scaberulous on the margins towards the apex and villous-hispidulous beneath, lower reduced to almost bladeless sheaths ; *sheaths* (lower) villous and reddish, upper glabrous and greenish, acutely angled, mouth often reddish-brown, with a whitish-membranous margin, truncate or produced into a tongue up to 6 mm. long. *Panicles* 1–4, terminal single, lateral borne on 1–3 curved or flexuous, slender, longly or very longly exserted peduncles, 2–10 cm. long, 1–2·5 cm. broad, becoming rather dense, at nodes longly or very longly spaced from one another, ellipsoid or oblong in outline, branches and spikelets slightly spreading. *Bracts* falling far short of the apex of the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 5–8 mm. long. *Female glumes* widely ovate to ovate-lanceolate and lanceolate, apex acuminate, 5–7 mm. long, glabrous, whitish to light yellow-green with reddish spots and streaks and a dark reddish margin, or wholly reddish with a greenish strip along the midrib, midrib sometimes excurrent in an awn up to 1 mm. long. *Achene* cylindric, ellipsoid-cylindric, ellipsoid-globose, or subglobose, obscurely trigonous, 2–3 mm. long, 1·75–2·3 mm. broad, scarcely to distinctly alveolate to lacunose, with continuous lines and discontinuous tufts of fine subadpressed hairs along the raised lines, pale or whitish, disc deeply trilobed, lobes usually narrowly lanceolate and acuminate, up to 1·5 mm. or more long, apex sometimes bifid, stramineous, apex of achene scarcely or very shortly beaked.

Sierra Leone : Malo Salija, rather moist sandy places, edge of path, 29 Nov. 1926, *Deighton* 345 (K) ; Gbinti, edge of marsh, 8 Jan. 1928, *Deighton* 982 (BM, K) ; Mabala (Mapaki Chiefdom), in shallow water, edge of stream, 14 July 1930, *Glanville* 221 (K) ; near Rokon, Samu, in standing water in swamp, 25 July 1951, *Jordan* 482 (K) ; Rosino, Samu, in tufts in newly drained swamp, 18 Dec. 1951, *Jordan* 737 (K).

Liberia : Duport, in wet, slightly brackish sandy soil, 15 Nov. 1926, *Bequaert* in *Linder* 1459 (K).

Ubangi-Shari : Haut-Oubangui ; marsh at 70 km. to the west of Yalinga, 27 Aug. 1921, *Le Testu* 3170 (P) ; Kaga Ndokpwa, 35 km. north of Bambari, 12 Oct. 1925, *Tisserant* 2067 (P) ; 7 km. to the south of Bozoum, marsh near " galerie ", 14 Aug. 1932, *Tisserant* 3139 (P).

Belgian Congo : Katchaka, Dec. 1913, *Vanderyst* 2839 (BR) ; Kasai, Atené, Jan. 1914, *Vanderyst* 3136 (K) ; Mokaba, 5 April 1914, *Vanderyst* 3833 (K) ; Lower Congo ; Leopoldville, 1915, *Achten* 97A (BR), 97B (BR) ; Kisantu, Kipasa, Dec. 1932, *Vanderyst* 38094 (BR) ; valley between Ngidinga and Kimvula, peat bog on wet sand, 30 Jan. 1948, *Duvigneaud* 162 (BRLU) ; Ngidinga, Mfidé valley, marshy savannah, 12 April 1948, *Duvigneaud* 691 (BRLU) ; Uele, Garamba National Park, + 900 m., 13 Aug. 1952, *Troupin* 1844 (BR) ; and 11 further gatherings (seen) in the Brussels Herbarium.

Uganda : near Kipayo, low swamp in grassland, rare, 1200 m., June 1914, *Dümmer* 874 (K) ; occasional in *Papyrus* at Namanve swamp, Kiagwe, 1170 m., March 1932, *Eggeling* 489 (K) ; Kampala, King's Lake, 1170 m., marshy area, upper side of lake, really moist place, frequent, 5 Dec. 1935, *Chandler & Hancock* 92 (K) ; Mile 10 Entebbe Road, edge of swamp, 1170 m., June 1937, *Chandler* 1685 (K).

Tanganyika : Kyimbila District ; north of Lake Nyasa, 13 May 1912, *Stolz* 1265 (K) ; river basin of the upper Ruhudje, Lupembe, north of the river, April 1931, *Schlieben* 644 (K) ; Bukoba District ; S. Bukoba, Biharamulo road, 1200 m., Aug. 1931, *Haarer* 2101 (EA, K) ; Bushasha swamp, permanently inundated, frequent, 14 Aug. 1934, *Gillman* 95 (EA, K) ; Gera swamp, 31 Aug. 1934, *Gillman* 138 (EA) ; Mafia Island ; Kilindona, waterlogged peaty area, 6 Aug. 1936, *Fitzgerald* 5211/3 (EA, K).

Nyasaland : Mt. Malosa ; 1200–1800 m., Dec. 1896, *Whyte* (K) ; Mt. Zomba, 1200–1800 m., Dec. 1896, *Whyte* (K).

9. **Scleria natalensis** *C. B. Clarke* in Dyer, Fl. Cap. 7 : 296 (1898).—Natal, *Buchanan* 352.

A medium sized perennial with few panicles and a stout, elongated or slowly creeping rhizome. *Stems* 50–70 cm. tall, 2·5–3·5 mm. thick below, smooth and glabrous throughout except that the rhachis of the terminal panicle is more or less villous-hispidulous. *Leaves* spaced throughout and sometimes rather crowded on the middle part of the stem below the bracts, mostly exceeded by but some exceeding the apex of the stem, 5–8 mm. wide, mostly flat or flattish, smooth except towards the apices where the margins and principal nerves are often scaberulous, lower reduced to shortly bladed or almost bladeless and vinaceous sheaths ; *sheaths* acutely angled, smooth, except at the sometimes sparsely hispidulous mouth, which is subtruncate or produced into a deltoid-rounded tongue up to about 3 mm. long, which usually has a dark reddish-brown membranous rounded extension up to a further 2 mm. *Panicles* at 2 nodes, the upper (terminal) much the larger, the lower often with its smaller lower part on apparently a separate peduncle, terminal 4–6 cm. long, 2–3·5 cm. broad, lower 2–3 cm. long, 1·5–2 cm. broad, dense, elliptic to more or less oblong in outline, branches and spikelets more or less obliquely spreading, lower on peduncles longly to very longly exserted from the bract-sheaths. *Bracts* exceeding or exceeded by the apex of the stem ; *sheaths* smaller than those of the leaf-sheaths. *Male spikelets* 5·5–6·5 mm. long. *Female glumes* lanceolate or ovate-lanceolate, cymbiform, apex acute to obtuse, 4–5 mm. long, glabrous, pale or whitish with wide or very wide reddish margins or almost wholly dark reddish-brown, midrib excurrent in an awn up to 1 mm. long. *Achene* quadrate-subglobose or oblong-subglobose, obtusely trigonous, 2·5–3 mm. long, about 2 mm. broad, reticulate-lacunose to tuberculate-lacunose, glabrous, dirty whitish, disc shortly trilobed, lobes ovate or oblong-ovate, stramineous, achene shortly beaked.

Natal : [without precise locality] *Gerrard* " recd. July 1865 " (K) ; *Buchanan* " recd Nov. 1875 " (K).

Transvaal : Barberton, Kaapsche Hoop, on rocks, 1650 m., 2 Jan., 1929, *Phillips* 7875 (K, PRE) ; Zoutpansberg, Entabeni, Nov. 1931, *Obermeyer* 30905 (PRE).

10. **Scleria melanomphala** *Kunth*, Enum. Pl. 2 : 345 (1837) ; C. B. Clarke in Dyer, Fl. Cap. 8 : 296 (1898), et in Dyer, Fl. Trop. Afr. 8 : 506 (1902) ; Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 36, t. 1, fig. 26–31 (1953).—South Africa, *Drège*.

Scleria macrantha Boeck. in Flora, 62 : 572 (1879), *non S. macrantha* Boeck. (1858).—Anglo-Egyptian Sudan, *Schweinfurth* 3746.

Scleria melanomphala var. *macrantha* (Boeck.) C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. 5 : 672 (1895).

Scleria melanomphala f. *oculo-albo* C. B. Clarke in Bull. Herb. Boiss., ser. 2, 1 : 59 (1901).—Belgian Congo, *Gillet* 321.

Scleria centralis Cherm. in Arch. Bot. Caen, IV, Mém. 7 : 50 (1930).—Ubangi-Shari, *Le Testu* 2436, *Tisserant* 1233.

A tall and rather stout perennial with large conspicuous long-peduncled panicles of blackish and green spikes and a stout rhizome. *Rhizome*

4–5 mm. thick, internodes short. *Stems* about 100–200 cm. tall, 4–7 mm. thick below (excluding leaf-sheaths), base more or less thickened, often smooth but sometimes, especially below, scabrid on the angles, which are acute, glabrous. *Leaves* mostly basal and subbasal, the basal ones reduced to nearly bladeless sheaths, and 1–3 spaced throughout the stem below the inflorescence, mostly shorter than but sometimes some upper ones overtopping the stems, 10–16 mm. wide, flat to revolute or more or less folded, smooth below, scabrid above on the margins and the 3 principal nerves, usually glabrous but sometimes sparsely to densely villous, especially on the upper surface ; *sheaths* usually scabrid on the acute or narrowly winged angles, glabrous to densely hispidulous-villous, mouth produced into a glabrous to villous tongue from very short to 5–10 mm. long, triangular to ovate in shape and with an acute to rounded apex. *Panicles* at 2–4 nodes, the lateral borne on 1–4, shortly to very longly, often curved, trigonous or compressed, smooth or scaberulous, usually glabrous but sometimes villous, unequally exserted pendulous peduncles, panicles 2–11 cm. long, 1–2 (3) cm. broad, at nodes longly to very longly spaced from one another, dense. *Bracts* mostly longer than their panicles, upper reduced ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 9 13 mm. long. *Female glumes* lanceolate, 7–9 mm. long, glabrous except the midrib above which is usually hispidulous and sometimes sparsely villous, pale with reddish, vinaceous, or purplish patches, or blackish- or vinaceous-red with a greenish midrib excurrent in a nearly glabrous to, usually, a hispidulous awn 1–3 mm. long ; *male glumes* more frequently blackish-red or blackish. *Achene* ovoid, sometimes oblong-ovoid, or ellipsoid with a truncate base, obtusely to obscurely trigonous, 4–5·25 mm. long, 2·5–3·5 mm. broad, smooth, sometimes extremely slightly verrucose, glabrous, white and shining with sometimes a small blackish or blackish-vinaceous, scarcely beaked apex, disc collar-like, about 1·5 mm. high, apex usually very shortly 3-lobed, stramineous.

A selection of specimens of *S. melanomphala* is cited below :

Sierra Leone : near Franziga, Tambakka, on wet alluvium, Feb. 1892, *Scott Elliot* 5046 (K) ; Kafoko, 240 m., 11 Sept. 1914, *N. W. Thomas* 2102 (K) ; Kaballa, 360 m., 18 Sept. 1914, *N. W. Thomas* 2258 (K) ; Jaima-Baima, Konno, in swamps, July–Aug. 1923, *Dawe* 536 (K) ; Southern Province, Pujehun, marsh, 10 April 1929, *Deighton* 1656 (K) ; Marigot, foot of the north slope of the Loma Mtns., 28 Sept. 1945, *Jaeger* 2021 (K).

Liberia : Jan. 1935, *Dinklage* 3380 (BM) ; Montserrado Co., Bushrod Island (adjacent to Monrovia), 15 Feb. 1948, *Baldwin* 11067 (K, MO, NY, US) ; Kolahun District ;, Gondolahun, 3 Nov. 1947, *Baldwin* 10104 (K, US) ; Gbarnga District ; in wet swale, 9 Sept. 1926, *Linder* 513 (K) ; Sanokwele District ; Ganta, 1 Nov. 1936, *Harley* 1041a (K) ; Sanokwele, in marsh, 25 Sept. 1947, *Baldwin* 9506 (K) ; Webo District ; Jabroke (Palipo), 9 July 1947, *Baldwin* 6508 (K, US).

Gold Coast : Axim district ; swamps, 5 Dec. 1901, *Johnson* (Gold Coast Herb. 1001) (K) ; ibid., swamps, 23 Jan. 1939, *Akpabla* 823 (K).

Nigeria : Northern Nigeria ; Naraguta, 23 June 1921, *Lely* 331 (K) ; Vom, Bauchi Plateau, 900–1350 m. [recd. at Kew 1922], *Dent-Young* 262 (K) ; [no precise locality], Aug. 1930, *Lely* P486 (K).

Ubangi-Shari : Haut-Oubangui ; Moroubas, open marsh at 10 km. to the north, 9 Sept. 1923, *Tisserant* 1233 (P) ; Bozoum, marsh, 31 Oct. 1931, *Tisserant* 2974 (P).

Belgian Congo : Lower Congo ; Stanley Pool, marshes and rice fields, 270 m., 20 April, 1888, *Hens* B67 (BM, K) ; Mokaba, 5 April 1914, *Vanderyst* 3848 (K) ; Eala, 14 Oct. 1946, *Leonard* 288 (K) ; Nioka (Ituri), 19 Sept. 1946, *Taton* 333 (K) ; Ruzizi Plain, March 1950, *Germain* 6653 (K) ; Katanga, Chisangwe, in dembo, Jan. 1912, *Homblé* 44 (K).

Anglo Egyptian Sudan : Bahr el Ghazal, Niamniam swamps at Huuh or Hoo River, *Schweinfurth* 3746 (K) ; Lado District ; *Cartwright* 17 bis (K) ; Zande District ; River

Hu, near Zambio, by water-hole, edge of wide sedge marsh, 1 July 1937, *Myers* 6929 (K).

Uganda : Buddu district ; March 1894, *Scott Elliot* 7482 (BM, K) ; Entebbe, 1909, *Fyffe* 55 (K) ; Kirerema, low swamp land, rare, 1200 m., June 1914, *Dümmer* 952 (BM, K) ; Gayaza Road, near Kampala, growing at edge of swamp in water, 1200 m., June 1931, *Snowden* 2074 (K) ; Nkoko, Mubende, swampy place but dry at this date, in small clumps, June 1935, *Johnston* 1053 (K) ; Kampala, King's Lake, marshy edge, 1170 m., *Chancellor-Hancock* 69 (K) ; W. Nile Province ; small valley ¼ mile due south of Maracha rest camp, marshy ground by small stream, 1380 m., 27 July 1953, *Chancellor* 55 (K).

Kenya : 7 miles east of Meru, edge of swamp, 1290 m., 8 July 1953, *Bogdan* 3745 (K).

Tanganyika : Lake Province ; Ukerewe Island or the area Mwanza to Masoma, c. 1928, *Conrads* 5173 (EA, K) ; Ufipa District ; Abercorn–Sumbawanga 30 miles, bare black earth in wet grassland, culms more or less solitary, 1500 m., 3 March 1951, *Bullock* 3744 (K).

Portuguese E. Africa : Massangulo, damp places, March 1933, *G. Sousa* 1264 (K).

Nyasaland : [without precise locality], 1891, *Buchanan* 691 (K) ; Plateau of Mt. Zomba, 1500–1800 m., *Whyte* (K) ; Livingstonia, characteristic of wet soils, 26 April 1924, *Shantz* 274 (K) ; [without precise locality], July 1935, *J. C. Smuts* 2313 (K) ; neighbourhood of Zomba, ± 900 m., 1936, *Cormack* 422 (K) ; Chitara farm, in seasonally saturated soils or river-bank, Feb. 1939, *Wilson* 8 (K) ; Kamgaloma, Kirk River, in relict *Syzigium* evergreen riverine forest, in shade, 16 Nov. 1950, *G. Jackson* 290 (K).

Southern Rhodesia : Melsetter District : Gazaland, near Chirinda, 1140 m., 3 Jan. 1906, *Swynnerton* 420 (K).

Northern Rhodesia : Mufulira, in swamp bush, 8 June 1934, *Eyles* 8181 (BM, K) ; Mwinilunga District ; by R. Lunga at Mwinilunga in damp marshy ground between gardens, 1 Dec. 1937, *Milne-Redhead* 3473 (K) ; Abercorn District ; Kali dambo, in wet marsh, 1560 m., 26 Jan. 1952, *Mrs. H. M. Richards* 557 (K) ; ibid., Lunzua Valley, 3 miles from Mpulungu road in bog in very thick grass and bushes, 900 m., 6 Feb. 1952, *Mrs. Richards* 648 (K) ; ibid. Chilongowelo, fire-break in damp marshes, 1500 m., 15 May 1952, *Mrs. Richards* 1702 (K).

Angola : Huilla ; plentiful at the cataracts of streams near Lopollo, Dec. 1859, Feb. 1860, *Welwitsch* 7144 (BM, LISU). Pungo Andongo ; marshy banks of small streams in wooded places near Quilongo, but not plentiful, Feb. 1857, *Welwitsch* 7145 (BM, LISU) ; Caconda, Jan. 1882, *Anchieta* 14 (LISU).

Natal : near the Umlaas River, 1840, *Krauss* 42 (K) ; Coast-land, Isikane, Feb.–April 1855, *Sutherland* (K) ; Inanda, 23 Dec. 1881, *Medley Wood* 1597 (K).

Zululand : [without precise locality], 600 m., 20 Dec. 1898, *Jenkinson* 8 (K) ; Mtunzini, 1 May 1919, *Mogg* 4318 (PRE) ; ibid., 18 Nov. 1919, *Mogg* 5806 (PRE).

E. Cape : Port St. John's ; upper grasslands, 4 Feb. 1919, *Moss* 4001 (K).

Tembuland : between the Bashee River and Morley, 300–600 m., Feb. 1840, *Drège* [4369, according to Clarke] (K).

S. friesii Kükenth. may belong here as suggested by Piérart with a question mark in Lejeunia, Mém. 13 : 62 (1953). It was described in Wiss. Ergebn. Schwed. Rhodesia-Kongo Exped., 1911 12, 1 : 9 (1921). I have not seen it.

11. **Scleria tisserantii** *Cherm.* in Archiv. Bot. Caen. 4, Mém. 7 : 50 (1931).—Ubangi-Shari, *Tisserant* 1339, 2692.

A rather tall medium-sized perennial with long-peduncled panicles of greenish spikes and a stoutish rhizome. *Stems* 45–75 cm. tall, 3–5 mm. thick below, base not or scarcely thickened, smooth throughout or sometimes slightly scaberulous on the rhachis, sparsely or sub-densely villous. *Leaves* occupying and sheathing much of the stem below the inflorescence, basal ones much reduced, shorter to longer than the stems, 7–10 mm. wide, mostly flat or flattish, smooth below, scaberulous towards the apices on the margins and on the under-surface midrib, villous on the margins and nerves or over most of the surface ; *sheaths*

smooth or slightly scaberulous on the angles in places, villous on the angles, mouth subtruncate or produced into a short, rounded, glabrous tongue. *Panicles* at 2–4 nodes, the lateral borne on 1–3 shortly to very longly, sometimes curved, trigonous or compressed, mostly smooth, glabrous or villous, unequally exserted, erect to slightly pendulous peduncles, panicles 2–8 cm. long, 1–2 cm. broad, at nodes longly spaced from one another, rather dense. *Bracts* mostly longer than their panicles ; *sheaths* similar to the leaf-sheaths but tongue longer (up to 5 mm. long). *Male spikelets* 7·5 10 mm. long. *Female glumes* lanceolate or ovate-lanceolate, about 8 mm. long, glabrous below, usually villous on the midrib and minutely hispidulous on the surface above, pale or light brown with a pale margin, midrib greenish, excurrent in a hispidulous awn 2–3 mm. long ; *male glumes* similar in colour. *Achene* cylindric with a rounded apex, or cylindric-ovoid, base truncate, obscurely trigonous, about 3·8–4 mm. long, 2·75–3 mm. broad, smooth, glabrous, dirty white, disc in the form of a narrow, adpressed, light brownish collar, scarcely lobed, with a slightly trigonous, very short, smaller, stem-like basal part.

Ubangi-Shari : Haut-Oubangui ; Moroubas, on laterite near water holes, at 15 km. to the north-west, 22 Nov. 1923, *Tisserant* 1339 (P) ; Yanguya, 50 km. south-east of Bambari, on laterite, 21 Sept. 1928, *Tisserant* 2692 (P).

The second of these gatherings in the Paris herbarium consists of more nearly complete specimens and I therefore make that the lectotype of the species.

12. **Scleria pterota** *Presl* in Isis 21 : 268 (1826) ; Core in Brittonia, 2 : 91, t. 2, fig. 18 (1936).—Porto Rico.

Scleria melaleuca Reichb. ex Schlecht. et Cham. in Linnaea, 6 : 29 (1831) ; Piérart in Lejeunia, Mém. 13 : 57, t. 3, figs. 1 & 2. (1953).—Surinam, *Weigelt.*

Scleria longifolia Boeck. in Flora, 65 : 30 (1882).—Madagascar, *Hildebrandt* 2924.

Scleria congolensis De Wild. in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 19, fig. 3 (1926).—Belgian Congo, numerous gatherings cited.

A rather tall and robust perennial, glabrous except for the leaf-sheaths, with narrow panicles and a shortly creeping stoutish rhizome. *Rhizome* with very short internodes probably about 3–4 mm. thick but obscured by the thickened base of the stems. *Stems* 30–115 cm. tall, 2·5–3 mm. thick below, usually smooth throughout, including the rhachis, but sometimes slightly scabrid above on the acute angles. *Leaves* spaced at intervals throughout the stem up to the bracts, shorter to longer than the stems, 5–11 mm. wide, usually flat or flattish, smooth below, scabrid above on the margins and principal nerves, sometimes hispidulous on many nerves on the under-surface, the basal ones reduced to almost bladeless sheaths ; *sheaths* glabrous to sparsely villous, narrowly winged, mouth produced into a deltoid or ovate-deltoid, glabrous, villous or reddish-ciliate tongue, up to 6 mm. long. *Panicles* 2–3, single at nodes, 2–7 cm. long, 1–2 cm. broad, loose to rather dense, branches only slightly spreading, terminal sessile, lateral panicles subdistantly spaced, on peduncles scarcely or very shortly exserted from the bract-sheaths. *Bracts* of the lateral panicles equalling or overtopping the stem, bract of

the terminal somewhat reduced ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4-4·75 mm. long. *Female glumes* widely ovate, acuminate, 3·5–5 mm. long, glabrous, pale usually with reddish streaks, or wholly reddish-vinaceous or blackish-red above, apex more or less recurved, midrib greenish, muticous or excurrent up to 0·75 mm. long. *Achene* globose or ovoid-globose, apex often slightly compressed, not or obscurely trigonous, 2·25–2·5 mm. long, 2-2·25 mm. broad, smooth and shining, glabrous above, small or very small tufts of fine whitish hairs below, especially near the disc, white with sometimes a small vinaceous or bluish-black apex, disc shortly trilobed, lobes rather thin, ovate or suborbicular, about 1 mm. long, apex shortly beaked.

Sierra Leone : [without precise locality], 1915, *N. W. Thomas* (K) ; Njala, shade, 17 May 1928, *Deighton* 1185 (K) ; Rokupr, Magbema, frequent in shady places on upland, 13 Nov. 1951, *Jordan* 677 (K).

Liberia : Gbarnga District ; Gbarnga, in wet swale, 9 Sept. 1926, *Linder* 516 (K) ; Webo District ; Nyaake (Webo), 22 June 1947, *Baldwin* 6119 (K) ; ibid., Sarbo, 6 July 1947, *Baldwin* 6385 (K).

Belgian Congo : Gadza, 1913, *Vanderyst* 1792 (BR, K) ; Wombali, Dec. 1913, *Vanderyst* 2288 (BR, K) ; Kasai, Mokaba, March 1914, *Vanderyst* 3609 (BR, K) ; ibid., *Vanderyst* 3636 (BR, K) ; ibid., April 1914, *Vanderyst* 3788 (BR, K) ; Kasai, Kitebe, forest, May 1914, *Vanderyst* 4108 (BR, K) ; Lower Congo, Bugunu, 28 May 1914 ; *Vanderyst* 4282 (BR, K) ; Leopoldville, wooded steppe, 12 April 1915, *Bequaert* 7291 (BR) ; Malela, margins of wooded swamps on the Congo, 3 July 1915, *Bequaert* 7932 (BR) ; muddy margin of the Yangambi River, 9 May 1948, *Leonard* 1745 (BR) ; Garamba National Park, about 30 km. along centre track, valley of the river Garamba, forest-clad massif on the river bank, 700–800 m., 28 Nov. 1951, *De Saeger* 1531 (BR, K) ; and 13 further gatherings (seen) in the Brussels Herbarium.

Zanzibar : Pemba Island ; Tundava, 1928, *Vaughan* 233 (BM, EA) ; ibid., Tondooni, common tussock herb in damp woodland on fairly heavy soil, 14 Feb. 1929, *Greenway* 1437 (EA, K).

Madagascar ; throughout tropical America.

In his account of Belgian Congo *Scleria* (Lejeunia, Mém. 13 : 1953) Piérart treats this white-fruited African species as synonymous with the American *S. melaleuca* Reichb. ex Schlecht et Cham., which bears fruits which usually become blackish-brown. *S. pterota* Presl, also American, generally has white fruits like the African *Scleria* described above, and as I am inclined to regard the two American species as one and the same, I choose *S. pterota* to represent the African one, because of their fruits being the same colour and because of the priority of this epithet.

13. **Scleria barteri** *Boeck.* in Linnaea, 38 : 504 (1874) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 507 (1902) ; Hutch. in Hook., Ic. Pl. t. 3191 (1933), et Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ;—Nigeria, *Barter* 1786.

A nearly glabrous perennial with scabrid-margined leaves, scrambling and climbing over bushes and short trees up to a height of about 30 ft. *Rhizome* unknown to me. *Stems* lianiform, up to 9 m. tall, up to 5 mm. thick or more well above the base, sometimes smooth but usually strongly retrorsely scabrid on the angles, which are acute, glabrous, hispidulous on the rhachis and its branches. *Leaves* numerous, occupying and sheathing much of the stem up to the bracts, of average length, upper 2–6 mm. wide, flat to strongly revolute-plicate, glabrous, smooth on the upper surface, scabrid on the margins and on the under-surface midrib ; *sheaths* glabrous to shortly pubescent or hirsute, angles acute, scabrid, mouth strongly

produced into an oblong or oblong-ovate, dark reddish tongue, with a scarious, eventually erose apex, up to 6 mm. or more long. *Panicles* 2–3, single at nodes, 2–7 cm. long, 1·5–5 cm. broad, rather loose, branches and spikelets usually patently spreading, to give a typical pyramidal outline, terminal sessile, lateral panicles subdistantly to distantly spaced, on peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* mostly overtopping the stem ; *sheaths* glabrous more often than the leaf-sheaths. *Male spikelets* 4–6 mm. long. *Female glumes* lanceolate or ovate-lanceolate, acuminate, 5–6 mm. long, glabrous or slightly and minutely hispidulous on the midrib towards the apex, pale or greenish below and along the midrib, otherwise usually blackish-red, midrib usually not but sometimes shortly excurrent. *Achene* ovoid or cylindric-ovoid, obtusely to obscurely trigonous, 3–3·5 mm. long, 2–2·5 mm. broad, smooth, sparsely to subdensely and minutely hairy, from pale lilac to bright violaceous, rarely whitish, disc well developed, suborbicular but scarcely lobed, thickish, apex very shortly but stoutly beak-like.

Sierra Leone : Kambia, on the Gt. Scarcies river, climbing about 20 ft. in dense bush, 1 Jan. 1892, *Scott Elliot* 4388 (BM, K) ; Rowalla, 150 m., 23 July, 1914, *N. W. Thomas* 1195 (K) ; Centr. Prov., rambling . . . 20–30 ft. in scrub or bush in moist lands, July–Aug. 1923, *Dawe* 545 (K) ; Sakola (Peri chiefdom), very common, 19 Oct. 1931, *Fisher* 48 (K) ; " Galerie forestière des sources du Niger ", 15 Oct. 1944, *Jaeger* 125 (K), and 3 other sheets in Kew Herbarium.

Liberia : Gbarnga District ; Gbarnga, 3 miles N.E. of Suacoco, makes progress in bush difficult, 13 Oct. 1950, *Daniel* 26 (K) ; and 9 other sheets in Kew Herbarium, cited in Nelmes and Baldwin, Cyperaceae in Liberia (Amer. Journ. Bot. 39 : 392 : 1952), mostly collected by Baldwin.

Gold Coast : Tarkwa, 19 Dec. 1901, *Johnson* 1000 (K) ; Gov . Oil Palm Plantation Anaje, 8 Oct. 1925, *Howes* 988 (K) ; [without precise locality], Nov. 1930, *Irvine* 1522 (K) ; Kumasi, old farm lands in forest, 300 m., Aug. 1932, *Vigne* 2407 (K) ; ibid., 23 July 1948, *Thorold* 109 (K).

Nigeria : Onitsha, Lower Niger, climbing over shrubs and trees . . . rendering passage impossible . . . *Barter* 1786 (K) ; Lagos Bot. Stn., Ilaro, swamp land, Jan. 1893, *Millen* 97 (K) ; S. Nigeria, Oban, 1911, *Talbot* 855 (BM, K) ; Lagos, 21 Dec. 1927, *Hagerup* 804 (C) ; Barombi Reserve, high forest margin, 13 Feb. 1946, *Dundas* (FHI 13985) (K) ; Sapoba F.R., in Taungya Area, 3 Nov. 1946, *Keay & Onochie* (FHI 21611) (BM).

Fernando Po : *Vogel* 87 (K) ; Dec. 1859, *Mann* 113 (K).

French Cameroons : Yaúnde Station, 800 m., 1890–94, *Zenker & Staudt* 376 (K) ; ibid., *Zenker & Staudt* 423 (BM, K) ; Batanga, common, 1 Aug. 1895, *Bates* 342 (BM, K) ; Bipindi, primitive forest, 1908, *Zenker* 3651 (BM, K).

Spanish Guinea : Bebai, " Campogebeit ", 11 Nov. 1908, *Tessmann* 630 (K).

Ubangi-Shari : Haut-Oubangui ; River Bémindu, 80 km. east of Bambari, underwood, 10 Jan. 1924, *Tisserant* 1424 (P).

Belgian Congo : Central Congo ; Yangambi, 1913, *Michiels* 14 (K) ; ibid., Eala, 1925, *Robyns* 500 (K) ; ibid., 11 Nov. 1943, *Germain* 1704 (K) ; between Yaokela and Yangole, March 1937, *Louis* 3398 (K) ; between Stanleyville and Wamba, 15 July 1937, *Louis* 4498 (K) ; Yangambi, 13 July 1938, *Louis* 10282 (BM, K).

Uganda ; Sese Islands, 1170 m., Nov. 1904, *E. Brown* 120 (K) ; ibid., 1200 m., " recd. 25 Nov. 1907," *Dawe* 955 (K) ; forest paths, Segibwa Falls, 1200 m., Nov. 1914, *Dümmer* 1079 (K) ; Sese, Bukasa, open spots in rain-forest, frequent, 10 ft. high in dense festoons, 1170 m., 8 June 1932, *Thomas* 160 (K) ; W. Entebbe, Kitobe, edge of forest thicket, Feb. 1936, 1170 m., *Chandler* 1551 (K) ; Sese, Bugala, Kalangala, forest edge, 1200 m., July 1945, *Purseglove* 1702 (K) ; Buganda Province ; Kyewaga Forest, on east side of Entebbe bay, about 2 miles from the town, 1125 m., 3 Sept. 1949, *Dawkins* 352 (BM, K).

Angola : Panga Mongo, Maiombe, 11 Feb. 1916, *Gossweiler* 6255 (LISU).

Zanzibar : Pemba Island ; *Vaughan* 622 (K) ; W. of Pemba, fairly common in woodlands and damp shady places throughout Pemba, 17 Feb. 1929, *Greenway* 1458 (K).

Scleria barteri in Africa has violet or, rarely, whitish-violaceous fruits. In Pemba and Madagascar they are whitish, but hairy as in typical specimens, and these may prove, when more material is available, to be varietally or perhaps specifically distinct.

Piérart (Lejeunia, Mém. 13 : 49 : 1953) considers this species to be synonymous with the American *S. secans* (L.) Urban. I am unable to follow him in this view. The American plant has fruits which approach subglobose in shape, are mostly quite glabrous and white in colour. The fruits of *S. barteri* on the other hand, are ovoid or cylindric-ovoid, pubescent, and nearly always wholly bluish.

I do not know *S. buettneri* Boeck. (Cyper. Nov. 1 : 36 : 1888), which was based on *Büttner* 8, collected at Sibange Farm, Gabon, but its description strongly suggests that it is *S. barteri* Boeck.

14. **Scleria iostephana** *Nelmes*, sp. nov. ; affinis *S. baroni-clarkei* De Wild. sed spicis masculis brevioribus, achaeniis majoribus, disco valde lobato differt.—Uganda, *Dawkins* 365.

A tall and rather stout shortly hairy perennial with thickened stem-bases and a short *rhizome*, which is not easily seen because of the thickened stem bases obscuring the short internodes, but is probably about 5 mm. thick. *Stems* 60–180 cm. or rather more tall, 3–5 mm. thick above the base, smooth below and sometimes throughout but more often scaberulous on the more acute angles towards and on the rhachis, sparsely to densely hairy on the sides. *Leaves* numerous, occupying and sheathing much of the stem up to the bracts, long, 4–8 mm. wide, flat to plicate-revolute, sometimes smooth and glabrous, at least below, but more frequently scaberulous or scabrid on the margins and at least the principal nerves on the upper and sometimes the under-surface, where it is also often more or less densely hairy between the nerves, lower leaves reduced to almost bladeless sheaths ; *sheaths* more or less densely hairy, sometimes scaberulous on the acute angles, mouth more or less villous and ciliate, truncate or produced into a short tongue. *Panicles* 3–4, single at nodes, 2·5–7 cm. long, 1·5–6 cm. broad, becoming dense, branches usually obliquely spreading but sometimes patent or more strongly reflexed, lateral panicles distantly spaced, on peduncles scarcely or rather longly exserted from the bract-sheaths. *Bracts* equalling or overtopping the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4–4·75 mm. long. *Female glumes* widely ovate to ovate-lanceolate, 4–5·5 mm. long, glabrous, or hispidulous above on the midrib, less commonly wholly hispidulous, pale with reddish streaks below and along the midrib area, otherwise dark reddish or blackish-red, nerveless or indistinctly and very slenderly nerved, midrib sometimes excurrent in an awn up to 1 mm. long. *Achene* ovoid, ellipsoid, or subglobose, obscurely trigonous, 3·25 4 mm. long, 2·4–2·8 mm. broad, smooth, glabrous, white below, upper half to much less than half violet to brownish-blue or blackish-blue, strongly trilobed, lobes 1 mm. or rather more long, yellowish, apex stoutly but very shortly and tapering beak-like.

Nigeria : Kaduna Division ; shady side of water-hole near Kachia Road about 6 miles from Kaduna, 9 Dec. 1949, *Meikle* 778 (K).

Ubangui-Shari : Haut-Oubangui ; Moroubas, under-wood, " galerie ", 18 Oct. 1922, *Tisserant* 807 (P) ; Bozoum, marsh borders, 1 Oct. 1931, *Tisserant* 2921 (P) ; Bozoum, damp under-wood, 21 Dec. 1932, *Tisserant* 3221 (P).

Belgian Congo : river N'tombi-Lutété, 450–540 m., 27 Feb. 1888, *Hens* 249 (K) ; Central Congo ; Likimi, 1913, *De Giorgi* 1594 (K) ; Uele, between Niangara and Wamba, 1931, *Lebrun* 3229 (K) ; Kasai ; Kikwit, Jan. 1914, *Vanderyst* 3093 (K) ; Sankuru District, near Fariala, 12 Feb. 1923, *Jensen* 100 (C) ; Merode, 1930, *Vanderyst* 23475 (K).

Uganda : grassy hill-slope near Gaba, local, 1200 m., July 1915, *Dümmer* 2593 (BM, K); Entebbe, lake shore near forest, 1150 m., Aug. 1922, *Maitland* 78 (K) ; Sozi, Sese Islands, damp places on forest edge, 1110 m., Dec. 1922, *Maitland* 443 (K) ; Lake Nabugabo, 1155–1170 m., boggy place in forest, fringing lake, July 1937, *Hancock & Chandler* 1766 (K) ; Buganda Province ; Kyewaga Forest, east side of Entebbe Bay about 2 miles from the town, in open parts of shrub growth, 7 Sept. 1949, *Dawkins* 365 (K).

Tanganyika : Bukoba District ; Bogandika, ± 1200 m., Sept. 1931, *Haarer* 2185 (K) ; ibid., Bushasha, woodland, sandy loam, 1935, *Gillman* 308 (K) ; Mahenge, Sali, ± 35 km. south of Mahenge Station, common on the side of the Ubesi river, 950 m., 21 March 1932, *Schlieben* 1934 (BM, K).

Northern Rhodesia : Mwinilunga District ; evergreen vegetation in slowly seeping water at source of River Matonchi, straggling among shrubs, 19 Dec. 1937, *Milne-Redhead* 3742 (K) ; ibid., source of River Kanyamwana, just west of Dobeka Plain, in less shady places in evergreen vegetation, 8 Feb. 1938, *Milne-Redhead* 4497 (K).

Piérart included this species in *S. naumanniana* : to me the two are clearly distinct from each other.

The specific epithet refers to the bluish upper part of the achene.

15. **Scleria baroni-clarkei** *De Wild.* in Bull. Acad. R. Belg., Cl. Sci., Ser. 5, 13 (10–11) : 703 (1927) ; Piérart in Lejeunia, Mém. 13 : 51, t. 3, fig. 10 (1953).—Based on *S. clarkei* De Wild.

Scleria clarkei De Wild. in Bull. Soc. Bot. Belg., 54 : 130, t. 5 (1927), *non S. clarkei* Lindmann (1901).—Belgian Congo, *Demeuse* 103.

A tall and rather robust, hairy perennial with a narrow inflorescence composed of rather small panicles. *Rhizome* absent, probably stout and creeping. *Stems* 65–90 cm. tall, 2–3 mm. thick below, glabrous below, minutely villous-hispidulous above and on the rhachis, angles smooth. *Leaves* widely spaced throughout the stem up to the bracts, long and some exceeding the stems, 5–7·5 mm. wide, flat to strongly revolute on the margins, smooth below, scaberulous or scabrid on the margins and principal nerves towards the apex, very sparsely to moderately villous over the under-surface, lower reduced to short-bladed sheaths ; *sheaths* mostly densely hispidulous, sometimes reddish, mouth usually produced into a rather short, rounded, minutely hispidulous tongue. *Panicles* 4–5, single at nodes, 2–4·5 cm. long, 1·25–3 cm. broad, lax, branches usually patently but sometimes obliquely spreading, upper panicles sub-approximate lowest distantly spaced, on peduncles scarcely or very shortly exserted from the bract-sheaths. *Bracts* overtopping the stem, upper reduced ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4·5 - 6 mm. long. *Female glumes* lanceolate or widely ovate-lanceolate, about 5 mm. long, glabrous, dark reddish-brown with a greenish midrib stripe, or wholly blackish-red, distinctly and often reddish-multinerved, midrib sometimes excurrent in a hispidulous awn up to 1 mm. long. *Achene* ovoid, base somewhat truncate, obscurely trigonous, 3 -3·25 mm. long, 2–2·25 mm. broad, smooth, glabrous, usually wholly light to dark violet except for a whitish base, but occasionally wholly dirty white, disc dark reddish-brown, wrinkled-orbicular, not or scarcely lobed, apex shortly tapering, beak-like.

Belgian Congo : Lower Congo, *Demeuse* 103 (BR) ; Ibali, 5 Nov. 1903, *Laurent* (BR) ; Sanda, May 1915, *Vanderyst* 5469 (BR).

16. **Scleria naumanniana** *Boeck.* in Engl. Bot. Jahrb. 5 : 94 (1884) ; Hutch. in Hutch. & Dalz., Fl. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 54, t.3, fig. 3–5 (1953).—Liberia, *Naumann.*

Scleria ovuligera Nees ex Boeck. in Linnaea, 38 : 497 (1874), *non* Reichb. ex Steud. (1855) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 507 (1902).—Sierra Leone, *Afzelius.*

A tall and rather large perennial with hairy leaf-sheaths and glabrous often pyramidal panicles. *Rhizome* very short, about 3 mm. thick. *Stems* with base somewhat thickened and thus obscuring the very short internodes of the rhizome, 60–105 cm. tall, 2–4 mm. thick below, glabrous and smooth below and sometimes throughout, including the rhachis, but often pubescent above on the sides and hispidulous or scabridulous on the angles which are acute. *Leaves* not aggregated at or near the base but spaced at intervals throughout the stem up to the bracts, shorter to somewhat longer than the stems, 5–10 mm. wide, flat or flattish, sometimes plicate-revolute, smooth below, usually scaberulous on margins and midrib towards the apices, glabrous throughout or sometimes more or less villous on the under-surface, basal ones reduced to vinaceous almost bladeless sheaths ; *sheaths* often purplish or vinaceous, very sparsely to densely villous, narrowly winged, mouth usually produced into a very short or short (1–2 mm.), tapering or apically rounded villous tongue. *Panicles* 3–5, single at nodes, 3–8 cm. long, 1–7 cm. broad, loose to rather dense, branches slightly to patently spreading, giving a lanceolate to pyramidal outline, terminal sessile, lateral panicles subdistantly spaced, on peduncles scarcely to rather shortly exserted from the bract-sheaths. *Bracts* of the lateral panicles usually considerably overtopping the stem, bract of the terminal rather reduced ; *sheaths* similar to those of the leaf-sheaths. *Male spikelets* 3–4 mm. long. *Female glumes* widely to very widely ovate, acuminate, 2·5–3 mm. long, glabrous, pale and sometimes streaked light reddish with a reddish-black upper margin, or palish only at the base and centre otherwise reddish-black, midrib sometimes excurrent in an awn, glabrous or very minutely hispidulous and up to 0·5 mm. long. *Achene* ovoid or ellipsoid with a truncate base, not or obscurely trigonous, 2·75–3·25 mm. long, 2–2·5 mm. broad, smooth and glabrous, white or whitish, disc trilobed, with pale becoming yellowish, thickened, ovate or oblong lobes about 2 mm. long, apex very shortly beaked.

French Guinea : Macenta, on hill, 600–750 m., 14–15 Oct. 1947, *Baldwin* 9827 (K).

Sierra Leone : Sherbro Island, Nov. 1908, *Mrs. C. B. Hunter* (BM) ; Yetaya, 330 m., 23 Sept. 1914, *N. W. Thomas* 2393 (K) ; Jigaya, 330 m., 28 Sept. 1914, *Thomas* 2802 (K) ; near Njala, edge of marsh and moist bush paths, 5 Sept. 1931, *Deighton* 1994 (K) ; ibid., in deeper water than 1994, 5 Sept. 1931, *Deighton* 1995 (K) ; base of Sugar Loaf Mtn., stony ground, 300 m., 1 Nov. 1951, *Jones* 267 (K) ; Mt. Horton (Colony), near stream, 540 m., 13 Jan. 1952, *Jones* 302 (K) ; Rosino, Samu, deep water swamp, 3 Oct. 1952, *Jordan* 796 (K), and 4 further gatherings at Kew.

Liberia : 34 gatherings of this species were cited in an account of Liberian *Cyperaceae* by J. T. Baldwin, Jr., and me (Amer. Journ. Bot. 39 : 392 : 1952). Most of them were collected by Baldwin and are in the Kew Herbarium. It would not be reasonable to cite them again here. Further specimens received since are : Congotown, thicket, 31 Aug. 1952, *Barker* 1399 (K) ; ibid., red form of 1399, 31 Aug. 1952, *Barker* 1400 (K).

Ivory Coast : rocky hill near Issia on the Daloa to Abidjan Road, 13 Dec. 1953, *Boughey* 13602 (K).

Gold Coast : Govt. Oil Palm Plantation Anaje (near Sekondi), common on outskirts of bush, 8 Oct. 1925, *Howes* 989 (K) ; Coconut Plantation, Atwabo, 1931, *Fishlock* 6 (K).

Nigeria : S. Nigeria ; Lagos, 1905 or earlier, *Macgregor* 315 (BM, K) ; S. Nigeria ; Oban, 1911, *Talbot* 854 (K) ; S. Nigeria ; Lagos, common on Ikoyi Plains, 30 Dec. 1916, *Dalziel* 1302 (K) ; ibid., Ikoyi Plains at edge of swamp forest, 11 June 1917, *Dalziel* 1303 (K) ; Benin Division ; Lagos, 16 Dec. 1927, *Hagerup* 783 (C) ; Usonigbe F.R., Solo Plains area, 31 Oct. 1946, *Keay & Onochie* (FHI 19698) (BM) ; Ajagbodudu, near pond in palm plantation, 4 Aug. 1952, *Wright* 57a (K) ; ibid., Ishan District, Ulraja Govt. F.R., northern boundary towards east, along paths in *Dialium* forest, 18 Aug. 1953, *Onochie* (FHI 33259) (K).

Principe : Oquê Gaspar, ± 300 m., Feb. 1889, *Quintas* 17 (BM, COI) ; Oquê Pipi, secondary forest, near a stream, ± 300 m., 1932, *Exell* 496 (BM, COI) ; above Infante D. Henrique, secondary forest, ± 300 m., 19 Dec. 1932, *Exell* 615 (BM).

Cabinda : Chiluango, 1919, *Gossweiler* 7833 (K).

Belgian Congo : Lower Congo ; Kitobola, 1913, *Flamigni* 514 (K). Central Congo ; Bangala, swamp, 8 June 1888, *Hens* 132 (K).

Angola : Ambriz ; damp rocks between Ambriz and Quizembo, Nov. 1853, *Welwitsch* 7125 (BM, LISU) ; Panga Mongo, Maiombe, 8 Feb. 1916, *Gossweiler* 6243 (LISU) ; Belize, Maiombe, valley of the river Lufo, 20 Feb. 1919, *Gossweiler* 7833 (LISU).

17. **Scleria induta** *Turrill* in Kew Bull. 1914 : 137 (1914) ; Piérart in Lejeunia, Mém. 13 : 52, t. 3, fig. 6–9 (1953).—Angola, *Gossweiler* 3658, 3757.

S. duvigneaudii Piérart in Bull. Inst. R. Col. Belg. 22 : 351 (1951).—Belgian Congo, *Duvigneaud* 54.

A rather tall, rigid, rather hairy perennial with a stout rhizome, basally thickened stems, spadiceous panicles and strongly spreading spikelets. *Rhizome* with short internodes, 3–3·5 mm. thick, obscured by the thickened stem-bases. *Stems* 60–100 cm. tall, 2–3 mm. thick below (excluding leaf-sheaths), probably smooth and glabrous in about the lower half which is completely hidden by leaf-sheaths, and sometimes smooth and glabrous above but more frequently somewhat rough on the angles and more or less villous on the sides. *Leaves* numerous, occupying and sheathing much of about the lower half of the stem, up to the bracts, most shorter than the stems, 2–6 mm. wide, flat to strongly revolute, sometimes fairly smooth and glabrous throughout but often slightly scaberulous, at least above, on the margins and midrib and also more or less villous on the under-surface, lower reduced to almost bladeless sheaths ; *sheaths* vinaceous or dark reddish-brown and densely villous, sharply angled or narrowly winged, mouth produced into a deltoid or ovate, densely villous tongue up to about 4 mm. long. *Panicles* 2–3, single at nodes, 2–9 cm. long, 1·5–6 cm. broad, loose, terminal the largest and usually pyramidal, lateral more or less oblong, in outline, branches and spikelets becoming mostly patently spreading, panicles distantly to very distantly spaced from one another on peduncles scarcely or shortly exserted from the bract-sheaths. *Bracts* overtopping or falling short of the apex of the stem ; *sheaths* similar to the leaf-sheaths. *Male* spikelets 7·5–10 mm. long. *Female glumes* lanceolate or oblong-lanceolate, acuminate, 8–10 mm. long, often glabrous below, more or less hispidulous above, light greenish at the base and on the centre at least, otherwise dark reddish-brown or reddish-black, midrib excurrent in a hispidulous awn up to 2 mm. long. *Achene* ovoid or ellipsoid-ovoid, 4–5 mm. long, 3–3·25 mm. broad, smooth and glabrous, whitish to whitish-cinereous, disc trilobed-orbicular, lobes sometimes short, more or less ovate, usually deflexed, sometimes wrinkled, apex of achene not or scarcely beaked.

Belgian Congo : Kimuenza, Oct.–Nov. 1900, *Gillet* 1705 (BR) ; Kapanga, Oct. 1933, *Overlaet* 1022 (BR), 1025 (BR) ; Kasai, Kasiki aux Marungu, very widespread in the valleys and on the stream borders, 12 June 1939, *Van den Prande* 228 (BR) ; Kasai, between Kwango and Wamba, Pandi village, 11 Aug. 1944, *Germain* 2748 (BR, K) ; Lower Congo, between Ngidinga and Kimvula, open forest, 1948, *Duvigneaud* 54 (BR) ; Kasai, Panti region, savannah, 8 Feb. 1950, *Callens* 2258 (K) ; Kasai, Kakenda road, sandy and damp savannah, 9 Feb. 1950, *Callens* 2606 (K) ; Kisantu, Kibunda, dry forest, April 1953, *Callens* 4019 (K).

Northern Rhodesia : South Mwinilunga District ; Marunda, in deep shade in moss carpet on Kalahari sand, 1200 m., Sept. 1934, *Trapnell* 1617 (K) ; Mwinilunga District ; about 4 miles south of Mwinilunga, in *Cryptosepalum* woodland on sand, 3 Dec. 1937, *Milne-Redhead* 3502 (BM, K) ; ibid., just east of R. Kasompa, in *Cryptosepalum* woodland on sand, 1 Feb. 1938, *Milne-Redhead* 4431 (BM, K).

Angola : [without precise locality, recd. 1910], *Gossweiler* 3658, 3757 (K).

Gossweiler 3658 is much superior to the other gathering cited and I therefore choose it as lectotype.

18. **Scleria angolensis** *Turrill* in Kew Bull. 1914 : 136 (1914).—Angola, *Gossweiler* 4155.

A rather short, rigid, rather hairy perennial with a stout rhizome, basally thickened stems, greenish-brown panicles and suberect spikelets. *Rhizome* with very short internodes, 3–4 mm. thick, obscured by the thickened stem bases. *Stems* 20–35 cm. tall, 2–4 mm. thick below, smooth and glabrous throughout or sparsely ciliate-hispidulous on the angles towards and on the rhachis. *Leaves* numerous, occupying and completely sheathing more than half to almost the whole of the stem below the inflorescence, mostly much longer than the stems, 2 6 mm. wide, flat to strongly plicate-revolute, sometimes fairly smooth and glabrous throughout but often slightly scaberulous towards the apex on the margins, sometimes villous-hispid on the under-surface and even, sparsely, on the upper surface, lower reduced to bladeless sheaths ; *sheaths* yellowish to reddish, sparsely to densely and minutely hispidulous, angled, mouth produced into a short, densely villous, rounded tongue up to about 2 mm. long. *Panicles* 1–2 (3), single at nodes, 1–3 cm. long, 0·5 1 cm. broad, more or less oblong in outline, branches and spikelets suberect, panicles subapproximate to distantly spaced on peduncles scarcely or shortly exserted from the bract-sheaths. *Bracts* overtopping the stem, upper reduced ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 8–15 mm. long. *Female glumes* lanceolate or oblong-lanceolate, acuminate, 9–11 mm. long, glabrous but midrib hispidulous above, pale greenish tinged brown with reddish-brown streaks, midrib excurrent in a hispidulous awn up to 2 mm. long. *Achene* ovoid, ellipsoid, or oblong-ellipsoid, 5–6 mm. long, 3·5–3·75 mm. broad, smooth and glabrous, whitish to whitish-cinereous, disc trilobed-trigonous, deflexed, sometimes wrinkled, sometimes forming a trigonous collar nearly 2 mm. long, apex of achene not beaked.

Belgian Congo : Gombe y Tumba, savannah, 12 Feb. 1950, *Callens* 2150 (K).

Angola : [without precise locality, recd. 1910], *Gossweiler* 4115 (K).

Piérart (Lejeunia, Mém. 13 : 52 : 1953) treats *Scleria angolensis* as a synonym of *S. induta* Turrill but they seem to me to be distinct species.

19. **Scleria goossensii** *De Wild.* in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 20, fig. 4 (1926) ; Piérart in Lejeunia, Mém. 13 : 35, t. 1, fig. 25 (1953). —Belgian Congo, several gatherings cited including *Goossens* 2443 and 2667.

Scleria goossensii var. *depressa* Cherm. in Bull. Soc. Bot. France, 83 : 496 (1936).—Gabon, *Le Testu* 8889, 8906.

A tall and rather stout, glabrous to hairy perennial with bulbously thickened stem-bases and a stoutish rhizome. *Rhizome* with short internodes, about 3–4 mm. thick, obscured by the thickened stem-bases. *Stems* 80–200 cm. tall, 3–4·5 mm. thick below, smooth on the angles and glabrous on the sides except just below the nodes on the upper part where the sides are hispidulous. *Leaves* rather numerous, occupying and sheathing much of the stem below the bracts, long but most shorter than the stems, 5–8 mm. wide, flat to strongly plicate-revolute, smooth throughout or slightly scaberulous towards and at the apex, glabrous throughout or up to densely villous-hispidulous on the under-surface, lower leaves much reduced ; *sheaths* nearly glabrous to densely and often reddish-hispid, acutely angled, mouth produced into a deltoid or rounded hispid-margined tongue 3-7 mm. long. *Panicles* 2 -5, single rarely binate at nodes, 3–12 cm. long, 1·5–4 cm. broad, rather dense, pyramidal to more or less oblong in outline, branches and spikelets mostly obliquely spreading, subapproximate to distant from one another, on peduncles scarcely to moderately exserted from the bract sheaths. *Bracts* not usually and not much exceeding the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 5–6 mm. long. *Female glumes* widely ovate-lanceolate or ovate-acuminate, 5–7 mm. long, glabrous, pale with fine reddish streaks or with dark reddish or vinaceous patches or wholly very dark reddish-brown, midrib sometimes excurrent in an awn up to 1 mm. long. *Achene* globose or slightly compressed-globose, 2·5-3 mm. long, 2·25 -2·5 mm. broad, thinly verrucose-muricate, glabrous, pale, becoming light brownish, disc orbicular, collar-like, sometimes undulate but scarcely or very shortly trilobed, reddish-brown, apex of achene very shortly apiculate.

Belgian Congo : Central Congo ; Eala, 1924, *Goossens* (K) ; above Eala, June 1936, *Louis* 1905 (BM, K) ; Eala, 30 July 1936, *Couteaux* 43 (K) ; below Isangi, 15 Oct. 1948, *Germain* 4624 (K) ; Territory of Isangi, 1 May 1949, *Germain* 4879 (K).—*Goossens* 2667, in the Brussels Herbarium, has been chosen as lectotype by Dr. W. Robyns.

Gabon : Djoua ; Mambanza, Sept. 1932, *Le Testu* 8889 (Le T) ; Kembona, banks of the Liboumba, Sept. 1932, *Le Testu* 8906 (Le T).

20. **Scleria pachyrrhyncha** *Nelmes*, sp. nov. ; affinis *S. goossensii* De Wild. sed glumis femineis minoribus hispidulis, achaeniis majoribus laevibus valde rostratis differt.—Tanganyika, *E. M. Bruce* 669.

A tall, robust, rather pubescent perennial with a large and loose inflorescence. *Stem* nearly 100 cm. tall, about 3 mm. thick below, mostly hidden by leaf-sheaths but probably smooth and glabrous below and hairy above. *Leaves* occupying and sheathing much of the stem below the bracts, long but shorter than the stem, 7–9 mm. wide, flat or flatish, scaberulous towards the apex on the margins and on the midrib on the under-surface, villous on the under-surface and hispidulous along the midrib on the upper surface, lower leaves reduced to scarcely or shortly bladed sheaths ; *sheaths* sparsely to subdensely villous-hispid, acutely angled or narrowly winged, mouth concave, truncate, or, more often, produced into a deltoid or ovate, reddish hispid-margined tongue up to 4 mm. long. *Panicles* 2 or more, merging into one another apically, about 7–9 cm. long, about 5–7 cm. broad, loose, more or less elliptic in

outline, branches and spikes obliquely spreading, on peduncles scarcely or shortly exserted from the bract-sheaths. *Bracts* exceeding the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 5–7 mm. long. *Female glumes* ovate, acuminate, 4–5 mm. long, minutely hispidulous, light greenish with reddish-brown streaks and patches to wholly reddish-brown, midrib excurrent in an awn from very short up to 1 mm. long. *Achene* ellipsoid or ellipsoid-globose and obtusely trigonous, with the angles sometimes strongly developed, 3–4 mm. long (including the beak), 2·5–2·75 mm. broad, smooth and glabrous, white becoming light blackish and dark blackish-brown in places, disc shortly or very shortly trilobed, yellowish, apex of achene distinctly (0·5 mm.) and stoutly beaked.

Tanganyika : Morogoro District ; Bunduki, forest, occasional, 1650 m., 27 Jan. 1935, *E. M. Bruce* 669 (BM, K).

The rather better specimen, in Herb. Kew., is the holotype.

21. **Scleria spiciformis** *Benth.* in Hook., Niger. Fl. 556 (1849) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 506 (1902) ; Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 39, t. 2, fig. 3 (1953).—Liberia, *Vogel* 107.

A medium-sized, hairy, loosely to densely tufted perennial with oblong, simple, dense panicles composed of female and more or less curved, reddish male spikelets. *Rhizome* very short, about 2 mm. thick. *Stems* with base thickened and thus obscuring the very short internodes of the rhizome, 30–75 cm. tall, 1·5–2 mm. thick, glabrous below, sparsely to densely villous or hispidulous above on the main rhachis, trigonous or compressed, angles acute. *Leaves* few at and near the base, where they are reduced to bladeless or almost bladeless and vinaceous sheaths, with 1-several higher on the stem, below the bracts, longer to shorter than the stems, 3–6·5 mm. wide, flat to plicate-revolute, usually smooth except for slight scabridity on the margins and midrib towards the apex, glabrous to densely villous ; *sheaths* sparsely to densely and often reddish-villous or hispidulous, and often ciliate on the wide wings, mouth produced into an often reddish, tapering or rounded, reddish-hispidulous tongue, 1–5 mm. long. *Panicles* 2–3, single at nodes, 1–4 cm. long, 1–2 cm. broad, dense, terminal the largest and sessile, lateral ones from approximate to distantly spaced, on peduncles scarcely or shortly exserted from the bract-sheaths. *Bracts* of the lateral panicles equalling to much overtopping the stem, bract of the terminal reduced ; *sheaths* similar to the leaf-sheaths. *Male spikelets* more or less recurved, obliquely spreading, 7 9 mm. long. *Female glumes* lanceolate, long-acuminate, 6–7 mm. long, hispidulous, at least above, and reddish or vinaceous, villous or ciliate on the margins and midrib, pale below or with reddish streaks, reddish or vinaceous above, midrib sometimes excurrent up to 1 mm. long. *Achene* ovoid or oblong-ovoid, obscurely trigonous, 2–2·5 mm. long, 1·7–1·9 mm. broad, distinctly and closely longitudinally costate except at the apex where this is replaced by rather scattered tubercles, glabrous, pale or whitish, disc shortly trilobed, apex very shortly beaked.

French Guinea : Macenta ; on open rock in seepage, forms clumps 2 ft. across, 600–750 m., 14–15 Oct. 1947, *Baldwin* 9813 (K).

Sierra Leone : *Smeathman* (BM) ; Sugar Loaf Mtn., dry places on lower slopes, common, 10 Dec. 1891, *Scott Elliot* 3952 (K) ; Sherbro Island, 1908, *Mrs. C. B. Hunter* (BM) ; sandy marsh between Yoni and Ngepe, Bonthe Island, 10 Nov. 1931, *Deighton* 2292 (K) ; Loma Mtns., Bintumani Massif, wet rocks, Nov. 1944, *Jaeger* 784 (K) ; Sugar Loaf Mtn., south side of summit, on rock face, 720 m., 15 Oct. 1951, *T. S. Jones* 254 (K) ; ibid., 300–600 m., 1 Nov. 1951, *Jones* 266 (K), 270 (K), 279 (K) ; Picket Hill, 690 m., on rocks, 18 Nov. 1951, *Jones* 232 (K).

Liberia : Montserrado Co., Duport, 15 Nov. 1926, *Linder* 1456 (K) ; savannah east of Monrovia, 31 Aug. 1947, *Baldwin* 9180 (K). Vonjama District ; on rock outcrop near Soplima, 1 Nov. 1947, *Baldwin* 10056 (K, MO, NY). Boporo District ; rock outcrop near Tawata, 15 Nov. 1947, *Baldwin* 10350 (K, US). Grand Bassa Co. ; Grand Bassa, July 1841, *Vogel* 107 (K).

Belgian Congo : Central Congo ; road from Coquilhatville to Bikoro, 21 Feb. 1944, *Germain* 1948 (K, YBI).

22. **Scleria bequaertii** (*De Wild.*) *Nelmes*, comb. nov., var. **bequaertii** (*De Wild.*) *Nelmes*.

Scleria bequaertii De Wild. in Rev. Zool. Afr., Suppl. Bot. 14 (2) : 17, fig. 2 (1926) ; Piérart in Lejeunia, Mém. 13 : 38, t. 2, fig. 1, 2 (1953).—Belgian Congo, *Bequaert* 7158, 7335, 7597.

A very slender and rather tall, more or less villous, perennial with tufted stems which become subprostrate, and slender simple panicles. *Rhizome* absent (? first year development) or short and stout (about 4 mm. thick). *Stems* 30–90 cm. tall, 0·5–0·75 mm. thick, glabrous below, villous towards and on the rhachis, base sometimes bulbously thickened. *Leaves* spaced on about the lower half of the stem, shorter than the stems, 1–2 mm. wide, flat to revolute, sparsely to densely subadpressed villous ; *sheaths* similarly villous, mouth produced into an acuminate villous tongue with a membranous apex, up to 3 mm. long. *Panicles* 2–3, spiciform, 3–5 cm. long, 2–5 mm. broad, longly to very longly spaced from one another, lax to rather dense, lateral ones on very slender peduncles exserted from the bract-sheaths. *Bracts* longer than their panicles ; *sheaths* as leaf-sheaths. *Male spikelets* 6–9 mm. long. *Female glumes* oblong-lanceolate, 4–5 mm. long, villous, especially above, and ciliate on margins and midrib, pale or light greenish with light reddish flushes above, midrib excurrent in an awn up to 1 mm. long. *Achene* oblong with a rounded apex or oblong-obovoid, obtusely trigonous, 1·3–2 mm. long, 0·8–1·3 mm. broad, slightly to strongly brownish or stramineous verrucose-trabeculate on a pale ground, glabrous, disc shortly or very shortly trilobed, apex of achene very shortly beaked.

Belgian Congo : Lower Congo ; Dolo, 1913, *Bavicchi* 344 (BR, K) ; Leopoldville, wooded steppe, 23 March 1915, *Bequaert* 7158 (BR) ; ibid., swampy steppe, 15 April 1915, *Bequaert* 7335 (BR) ; ibid., 15 May 1915, *Bequaert* 7597 (BR) ; Central Congo ; road from Bikoro to Coquilhatville, grassy formation, swampy part, 330 m., 21 Feb. 1944, *Germain* 1953 (BR, K) ; in ditch on road from Bikoro to Mabila, 18 May 1954, *Germain* 8377 (BR, YBI).

Of the three *Bequaert* numbers cited by De Wildeman, I choose 7597 to be the lectotype.

22. **Scleria bequaertii** *De Wild.* var. **laevis** *Piérart* in Lejeunia, Mém. 13, 39 (1953).—Northern Rhodesia, *Milne-Redhead* 4157.

A very slender and rather tall, nearly wholly glabrous perennial with slender simple panicles, forming prostrate masses, from a stout shortly creeping rhizome. *Rhizome* 3–5 mm. thick. *Stems* 30–90 cm. tall, about

0·5 mm. thick, wholly glabrous or sometimes minutely villous on the rhachis, loosely tufted or arising singly from the rhizome, forming prostrate masses, base sometimes somewhat bulbously thickened. *Leaves* spaced throughout the middle part of the stem up to the bracts, mostly shorter but some somewhat overtopping the stems, 1–3 mm. wide, flat to revolute, glabrous to sparsely villous, lower reduced to shortly bladed sheaths ; *sheaths* nearly glabrous to sparsely villous, much produced into an acuminate somewhat villous tongue, with an obtuse membranous prolongation, 2–3 mm. long. *Panicles* 2–3, spiciform, 3·5–7 cm. long, 2–10 mm. broad, longly to very longly spaced from one another, rather lax, lateral on very slender peduncles exserted from the bract-sheaths. *Bracts* mostly longer than their panicles ; *sheaths* as leaf-sheaths. *Male spikelets* 7–10 mm. long. *Female glumes* lanceolate or oblong-lanceolate, 4–5·25 mm. long, glabrous, pale or light greenish with castaneous margins or wholly castaneous above, midrib sometimes excurrent in an awn up to 1 mm. long. *Achene* oblong to ellipsoid-oblong but truncate at the base, obtusely or obscurely trigonous, 2–2·3 mm. long, 1–1·5 mm. broad, smooth or nearly so, glabrous, pale to whitish, becoming blackish in a longitudinal strip down the centre of each face, disc slightly trilobed, apex of achene extremely shortly beaked.

Belgian Congo : Kundelungu, 1650 m., swampy meadows over coarse blackish sand, Dec. 1952, *Van den Bulcke* in *Schmitz* 4307 (BR).

Angola : District of Moxico ; marshy slope near river Chibamba, forming prostrate masses, 16 Jan. 1938, *Milne-Redhead* 4157 (BM, BR, K).

Piérart's var. *laevis* is based on a smooth fruit character which may or may not be constant. There are no mature achenes on the type specimen but there are three in a capsule attached to one of the Kew sheets of this number. One of them is nearly smooth and the others are moderately verrucose-trabeculate. This strongly suggests that in *S. bequaertii*, as was found in several species of Sect. *Hypoporum*, smooth and sculptured fruits may occur on the same gathering and even on the same plant. On the other hand, the verrucose-trabeculate achenes above-mentioned may have belonged to specimens of the type variety growing with var. *laevis* and as other minor characters appear to be correlated with the near smoothness of the achene in this variety, it is treated as a distinct taxon in this revision.

23. **Scleria foliosa** *Hochst. ex A. Rich.*, Tent. Fl. Abyss. 2 : 509 (1851) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 503 (1902) ; Piérart in Lejeunia, Mém. 13 : 40, t. 2, fig. 4 & 5 (1953).—Ethiopia, *Schimper* 1232.

Scleria foliosa var. *major* Oliver in Trans. Linn. Soc. 29 : 169 (1872).—Uganda, *Speke & Grant.*

Scleria dillonii Boeck. in Flora, 61 : 38 (1878).—Ethiopia, *Quartin-Dillon & Petit*, in part.

Scleria dumicola Ridley in Trans. Linn. Soc., ser. 2, Bot. 2 : 169 (1884).—Angola, *Welwitsch* 7122.

A medium-sized, nearly glabrous, loosely to rather densely tufted annual, with rather dense, quite glabrous panicles. *Stems* 15–150 cm. tall, 1–3 mm. thick, usually scabrid but sometimes smooth on the acute angles. *Leaves* occupying and sheathing the lower part of the stem and situated also, at longer intervals, in the upper part below the bracteate

inflorescence, usually much shorter than but sometimes upper overtopping the stem, 2–7 mm. wide, flat or flattish, glabrous, smooth below, scabrid above on the margins and sometimes on the midrib beneath and on 2 principal nerves on the upper surface towards the apex, lower reduced to reddish bladeless sheaths ; *sheaths* usually glabrous but lower bladeless ones and sometimes others pubescent, mouth truncate or produced into a short, glabrous to densely villous tongue which is usually blackish-red margined and this margin sometimes has a white edge. *Panicles* 2–4, single at nodes, 1·5–6 cm. long, 1–2 cm. broad, longly spaced from one another, rather dense, terminal panicle sessile, lateral ones on peduncles scarcely to shortly or rather shortly exserted from the bract-sheaths. *Bracts* very much longer than their panicles ; *sheaths* similar to those of the leaves, more often villous from the mouth downwards. *Male spikelets* 4–5 mm. long. *Female glumes* ovate-lanceolate, 3–5 mm. long, glabrous, from lightish brown through pale with reddish streaks and blackish-red margins to wholly blackish-red above, midrib greenish, usually excurrent in a smooth or scaberulous-margined awn up to 1 mm. or rather more long. *Achene* ovoid but base rounded-truncate, not or obscurely trigonous, 3–4 mm. long, 2·1–2·5 mm. broad, mostly longitudinally verrucose-lacunose, glabrous, white, with a very short stipe, at the apex of which (base of achene) is situated a disc with three orbicular-ovate, stramineous lobes, each rather less than 1 mm. in diameter, the whole disc about 2 mm. in diameter, apex of achene shortly tapering beaklike.

Nigeria : Northern Nigeria ; Kumu, in water, 10 Oct. 1921, *Lely* 674 (K) ; ibid., wet plains, Sept. 1930, *Lely* P775 (K) ; Plateau Province ; Jos Division, Naraguta, along stream bank, 9 Oct. 1944, *Kennedy* 8047 (K) ; Bornu Province ; Maiduguri, damp spot, mixed with *Sacciolepis africana Hubbard & Snowden*, 20 Oct. 1950, *Johnston* 36A (K).

Belgian Congo : Ruzizi Plain, 27 Feb. 1950, *Germain* 6168 (K, YBI).

Anglo-Egyptian Sudan : river Sobat, Nile, *E. Evans Pritchard* (K).

Ethiopia : rather wet places near Gafta, 18 Sept. 1838, *Schimper* 1232 (BM, K, P) ; Chiré Plain (Shireh Prov.), Oct.–Nov. 1840, *Quartin-Dillon et Petit*, in part (K, P) ; Begemeder, swampy plain, 1350 m., 12 Sept. 1862, *Schimper* 210 (BM).

Uganda : (Unyora) Bunyora, marshes, Aug. 1862, *Speke & Grant* (K) ; Amuria, Teso, pool in rock, locally abundant, 1100 m., 14 Sept. 1946, *A. S. Thomas* 4537 (EA, K).

Kenya : Lake Province ; Ukerewe Island or the area Mwanza to Masoma, 1 Aug. 1928, *Conrads* (EA, Herb. No. 10539, K) ; Nairobi, 1650 m., 22 Sept. 1916, *Dawson* 426 (K) ; ibid., temporary wet grassland, 1650 m., 8 June 1947, *Bogdan* 729 (EA, K).

Tanganyika : between Zanzibar and Uyui, 1886, *W. E. Taylor* (BM) ; Usambara, Duga, meadows, Aug. 1893, *Holst* 3218 (K) ; Useguha, Hale towards Mnyussi, 280 m., 13 Aug. 1918, *Peter* 24274 (EA) ; Mwanza, 29 April 1926, *R. L. Davis* 282 (K) ; Lower Nduruma, Arusha, ± 960 m., June 1928, *Haarer* 1413 (EA, K) ; Shinyanga, *native collector* 2178 (EA, K) ; near Tabora, *Lindeman* 461 (K) ; Mwanza District, Mabale, Mbarika, in flooded black cotton soil, 1170 m., 9 May 1952, *Tanner* 777 (K) ; Tanga District ; Lwengera Valley, 4 miles east of Korogwe, 300 m., damp ground, margin of pools, gravel pit in sisal plantation, 20 July 1953, *Drummond & Hemsley* 3403 (K) ; Mwanza District ; Nghoyokoyo, Mbanka, 1125 m., marshy soil, 16 March, 1954, *Tanner* 1914 (K).

Portuguese E. Africa : Mocuba District ; Namagoa, common in wet ground or shallow standing water, June 1947, *Mrs. H. G. Faulkner* 151 (K).

Southern Rhodesia : Wankie, *F. A. Rogers* 13215 or 13216 (K) ; Victoria Falls, in rain-forest, ± 900 m., 10–15 March 1932, *Brain* 8788 (K) ; Hartley District ; Poole, on sour wet vleis as these dry up, 1200 m., 3 May 1945, *Hornby* 2413 (K).

Northern Rhodesia : Livingstone, 900 m., June 1909, *Rogers* 7169 (K) ; Kabulamwanda, 70 miles north of Choma, dambo, 990 m., 13 Feb. 1955, *Robinson* 1102 (K) ; 5 miles east of Choma, 1290 m., 27 March 1955, *Robinson* 1197 (K) ; Abercorn District ; Chilongowelo, Plain of Death, in small seasonal shallow pool, 1440 m., 5 May 1955, *Richards* 5530 (K).

South-West Africa : Tsumeb–Nosib path, km. 11, April 1934, *Dinter* 7432 (BM, K) ; Grootfontein district ; Abenab Gurnab, vlei soil, very rare, May 1934, *Schoenfelder* 808 (K, PRE) ; ibid., farm " Keibeb ", Sandveld, vley margin, abundant, 19 April 1950, *Schweickerdt* 2189 (PRU).

Angola : Pungo Andongo, rather rare in thicket-grown marches between Quilanga and Pedras de Guinga, Jan. 1857, *Welwitsch* 7122 (BM, LISU) ; ibid., between Caghuy and Sansamanda, with *Isoetes aequinoctialis*, April and May 1857, *Welwitsch* 7124C (LISU).

Transvaal : Zoutpansberg District ; May 1905, *Junod* 563 (Govt. Herb. 4666) (K, PRE).

Madagascar (*S. perrieri* Cherm.).

24. **Scleria schimperiana** *Boeck.* in Linnaea, 38 : 466 (1874) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 504 (1902).—Ethiopia, *Schimper* 1235.

Scleria hypoxis Schweinf. ex Boeck. in Linnaea, 38 : 465 (1874).—Anglo-Egyptian Sudan, *Schweinfurth* 2054.

Scleria schimperiana var. *hypoxis* (Schweinf. ex Boeck.) C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 504 (1902).

A medium-sized, loosely to rather densely tufted annual, with a rather hairy inflorescence. *Stems* 15–70 cm. tall, 1–3 mm. thick, smooth and sometimes reddish below, scaberulous on the acute angles, above, sides mostly glabrous but sometimes sparsely hispidulous-villous towards the apex. *Leaves* subbasal and somewhat higher, basal ones reddish, reduced to almost bladeless sheaths, much shorter to longer than the stems, 2–8 mm. wide, flat or flattish, smooth below, hispidulous-scaberulous above on the margins and the three prominent nerves ; *sheaths* often glabrous but sometimes villous, especially at and below the subtruncate to convex, membranous-margined mouth. *Panicles* 1–3, single at nodes, 1–5 cm. long, 1–2·5 cm. broad, longly spaced from one another, rather dense, terminal panicle sessile, lateral ones on villous-hispidulous peduncles shortly to longly exserted from the bract sheaths. *Bracts* slightly to very much longer than their panicles ; *sheaths* similar to those of the leaves, more often villous from the mouth downwards. *Male spikelets* 4–5 mm. long. *Female glumes* ovate-acuminate or ovate-lanceolate, 5–7 mm. long, glabrous except the midrib, castaneous to blackish-red above and on the margins, pale with reddish streaks below, midrib pale or light greenish, stoutish and more or less hispidulous above, usually not but occasionally shortly excurrent. *Achene* compressed-globose, not trigonous, 2·5–3 mm. long, 3–3·5 mm. broad, smooth, glabrous, white, disc shallowly to rather deeply 3-lobed, lobes shortly ovate to oblong-ovate, stramineous, 1 mm. or more broad, apex of the achene not beaked.

Ethiopia : Chiré plain (Shireh Prov.), Oct.–Nov. 1840, *Quartin-Dillon et Petit*, in part (K, P) ; Begemeder, Senka Berr, on the River Reb 2250 m., 7 Oct. 1863, *Schimper* 1235 (BM, K) ; Gallabat, Matamma region, 24 Sept. 1865, *Schweinfurth* 2054 (BM, K, P) ; near Woliso, marshy ground, heavy black clay over volcanic rock, 2400 m., 5 Oct. 1954, *Mooney* 5852a (K) ; Daraba, open waste land on very heavy (? calcareous) clay, much waterlogged, June to October, 1800 m., 20 Oct. 1954, *Mooney* 6091 (K).

Uganda : E. Acholi, Paloga, damp hollow, 960 m., April 1943, *Purseglove* 1362 (EA, K).

Southern Rhodesia : S. Rhodesia Govt. Herb., Salisbury, No. 2487 (K).

25. **Scleria globonux** *C. B. Clarke* in Dyer, Fl. Trop. Afr. 8 : 504 (1902) ; Piérart in Lejeunia, Mém. 13 : 43, t. 2, fig. 8 (1953).—Anglo-Egyptian Sudan, *Schweinfurth* 2560.

A rather tall and robust, tufted, sparsely villous annual, with a rather dense inflorescence. *Stems* 45–85 cm. tall, 1·25 3 mm. thick below, sometimes smooth and glabrous throughout, but often scaberulous on the angles and villous on the faces (sides) towards the terminal panicle. *Leaves* subbasal and above, the basal ones mostly reduced to sometimes vinaceous and almost bladeless sheaths, shorter than the stems, 4–9 mm. wide, flat or flattish, sometimes glabrous and smooth below, otherwise conspicuously villous-hispidulous and even scaberulous on the margins, on the under-surface midrib, on the two prominent sublateral nerves on the upper surface, and sometimes villous on other parts of the leaf surface ; *sheaths* glabrous or sparsely villous in places, mouth subtruncate to produced into a short rounded tongue with a membranous margin. *Panicles* 2–4, single at nodes, 2–6 cm. long, 1–2·5 cm. broad, longly spaced from one another, becoming somewhat dense, terminal panicle sessile, lateral ones on more or less villous-hispidulous peduncles scarcely to longly exserted from the bract-sheaths. *Bracts* mostly longer to very much longer than their panicles ; *sheaths* similar to those of the leaves, more frequently villous-hispidulous from the mouth downwards. *Male spikelets* 4–6 mm. long. *Female glumes* ovate-acuminate or ovate-lanceolate, 5–6·5 mm. long, glabrous or sometimes sparsely and minutely hispidulous on the midrib towards the apex, pale or light fulvous with reddish streaks or rarely bright reddish patches, midrib stoutish, sometimes up to 1 mm. excurrent. *Achene* nearly globose, 3–3·5 mm. long, 2·75–3 mm. broad, deeply and more or less squarely or sometimes oblong-lacunose, pale, with minute and sometimes reddish hairs along the walls of the lacunae, disc deeply 3-lobed, lobes oblong-orbicular, oblong or triangular-lanceolate, apex rounded to acute, stramineous, about 1 mm. long and a little less broad at the base, achene very shortly beaked.

Portuguese Guinea : Bafatá ; Contubo el e Djecoi, in shallow marshy ground, 19 Nov. 1950, *Espirito Santo* 2825 (K).

Sierra Leone : Jokibu, moist place near road, 6 Nov. 1939, *Deighton* 3776 (K) ; near Mateboi, Sanda Tenraran, wet places in rice swamp, 27 Nov. 1952, *Jordan* 841 (K).

Liberia : Gbarnga District ; Gbarnga, in wet swale, 9 Sept. 1926, *Linder* 515 (K).

Ivory Coast : Cercle du Baoule, between Kodiokoffi and the encampment, 12 Aug. 1909, *Chevalier* 22368 (K).

Gold Coast : Northern Territories ; near Burufo, swampy area, 15 Dec. 1950, *Adams & Akpabla* 4386 (K) ; ibid., 18 Dec. 1950, *Adams & Akpabla* 4392A (K).

Nigeria : Northern Nigeria ; Kontagora, marshes and ravines, 24 Nov. 1905, *Dalziel* 238 (K) ; Minna Division ; roadside ditch 5 miles north of Minna, 4 Dec. 1949, *Meikle* 723B (K).

Ubangi-Shari : Haut-Oubangui ; Balimbwa, 40 km. north of Bambari, marsh, 26 Nov. 1928, *Tisserant* 2755 (P).

Belgian Congo : Katanga ; Elizabethville, May 1914, *Rogers* 10319a (K) ; Urundi, Mosso, Kininya, 8 July 1952, *Michel* 3306 (BR, K) ; ibid, Mosso, Butetsi, swamps of the Malagarasi, 9 May 1952, *Michel et Reed* 1897 (BR).

Anglo-Egyptian Sudan : Bahr el Ghazal Prov. ; 23 Oct. 1869, *Schweinfurth* 2560 (K).

Uganda : Soroti, common on dry swamp edges, 1080 m., 14 Sept. 1954, *Lind* 369 (K).

26. **Scleria parvula** *Steud.*, Syn. Pl. Glum. II., Cyper. 174 (1855).—India, *Hohenacker* 1295.

Scleria uliginosa Hochst. ex Boeck. in Linnaea, 38 : 471 (1874).—India, *Hohenacker* 1295.

Scleria fenestrata Franch. et Savat., Enum. Pl. Japon. 2 : 122, 549 (1879).—Japan, no collection mentioned.

Scleria bambariensis Cherm. in Archiv. Bot. Caen, 4, Mém. 7 : 48 (1931).—Ubangi Shari, *Tisserant* 2693, 2694.

Scleria schmitzii Piérart in Lejeunia, Mém. 13 : 42, t. 2, fig. 7 (1953).—Belgian Congo, *Schmitz* 3115.

A slender, sparsely hairy annual with small, greenish to dark violaceous or vinaceous panicles and stem bases sometimes becoming bulbously thickened. *Stems* 15–80 cm. tall, 0·75–2 mm. thick below, smooth and glabrous throughout or sometimes sparsely villous above or on the rhachis, nodes sometimes vinaceous. *Leaves* few, occupying and sheathing most of the lower half or less of the stem, shorter to longer than the stems, 2–6 mm. wide, flat to plicate-revolute, smooth and glabrous below, sometimes villous on the under-surface and villous-scaberulous on the margins and principal nerves towards the apex, lower reduced to leafless or short-bladed sheaths ; *sheaths* glabrous or sparsely villous, acutely angled to narrowly winged, mouth nearly truncate or produced into a short, villous, membranous-margined tongue. *Panicles* at 1–3 nodes, single, binate, or ternate, 1–4 cm. long, 0·5–1 cm. broad, loose, more or less oblong in outline, spikelets slightly spreading, upper approximate lower distant or very distant from each other, on peduncles scarcely or shortly to longly and very longly exserted from the bract-sheaths. *Bracts* falling short of to exceeding the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4–6 mm. long. *Female glumes* ovate to lanceolate, 4·25–6 mm. long, glabrous, sometimes ciliate-hispidulous on the upper part of the midrib, pale greenish with reddish streaks and patches to almost wholly dark reddish-vinaceous, midrib usually excurrent in a hispidulous mucro or awn up to 1 mm. long. *Achene* obovoid-globose or quadrate-globose to oblong-ellipsoid, obscurely trigonous, 2–3 mm. long, 1·5–2·2 mm. broad, deeply and mostly squarely lacunose, hairy in tufts and continuous lines along the raised walls of the lacunae, whitish, disc deeply trilobed, lobes oblong or oblong-ovate, greenish to yellowish, with a whitish upper part which is sometimes forked into 2–3 acuminate apices, the whole lobe about 1 mm. long, apex of achene very shortly beaked.

Sierra Leone : Picket Hill, on rock face, 690 m., 18 Nov. 1951, *Jones* 204 (K).

Ubangi-Shari : Haut-Oubangui ; Yanguya, 40 km. south-east of Bambari, very damp laterite, 21 Sept. 1928, *Tisserant* 2693 (P) ; Kaga Lekpwa, 7 km. south of Ippy, wet gneiss, 6 Oct. 1928, *Tisserant* 2694 (P) ; Bozoum, marsh, 29 Oct. 1931, *Tisserant* 2971 (P) ; Bozoum, springs among rocks, 29 Nov. 1931, *Tisserant* 3002 (P).

Belgian Congo : Ikengo, ± 30 km. downstream from Coquilatville, under the Equator, wooded boggy islet, ± 330 m., 26 Dec. 1943, *Germain* 1833 (BR) ; Kundelungu, margin of forest strip, 1700 m., 5 Oct. 1950, *Schmitz* 3115 (BR).

Kenya : 10 miles south-west of Mombasa, swampy banks of stream, 120 m., 3 Dec. 1951, *Bogdan* 3344 (K).

Tanganyika : between Tanga and Maramba, 125 m., 24 Sept. 1918, *Peter* 24963 (EA).

Northern Rhodesia : Kabulamwanda, 70 miles north of Choma, dambo, 990 m., 13 Feb. 1955, *Robinson* 1103 (K) ; ibid., among more robust grasses, 990 m., 13 Feb. 1955, *Robinson* 1111 (K).

India, Japan, Madagascar.

27. **Scleria mikawana** *Makino* in Bot. Mag. Tokyo, 27 : 57 (1913) ; Ohwi in Mem. Coll. Sci., Kyoto Imp. Univ., ser. B, 18 : 7 (1944).—Japan, *Makino*, *Nagura*.

Scleria glabroreticulata De Wild., Pl. Bequaert. 4 : 230, fig. 4 (1927) ; Piérart in Lejeunia, Mém. 13 : 43, t. 2, fig. 9, 10, 22 (1953).—Belgian Congo, *Vanderyst* 2232.

A tall rather slender nearly glabrous annual with narrow depauperate loose panicles and a very short or scarcely any rhizome. *Stems* about 40 110 cm. tall, 3–4 mm. thick near the base, often smooth throughout, including the rhachis, but sometimes angles scaberulous in places, glabrous. *Leaves* few and reduced to almost bladeless sheaths below, others spaced through the middle part of the stem, below the bracts, falling far short of the apex of the stem, 3–7 mm. wide, flat to plicate, usually smooth, even the apices, which are shortly attenuated, but sometimes slightly scaberulous in places, glabrous ; *sheaths* mostly glabrous, sometimes sparsely pubescent below the pubescent mouth which is usually produced into a very short and rounded tongue, angles acute to shortly winged. *Panicles* 2 4, single at nodes, 2 5 cm. long, 0·5–1·5 cm. broad, very loose, longly to very longly spaced from one another, lateral ones on peduncles scarcely or very shortly exserted from the bract-sheaths. *Bracts* foliaceous, from falling far short of to exceeding the apex of the stem ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4 5 mm. long. *Female glumes* lanceolate, 4–5 mm. long, glabrous, pale greenish with a darker green midrib, often with brownish-red streaks and patches, sometimes almost wholly reddish, midrib sometimes shortly excurrent. *Achene* more or less globose, quadrate-globose or ellipsoid, obscurely trigonous, 2·25 2·5 mm. long, about 2 mm. broad, lacunose with the lacunae longer than broad, pale or whitish on the walls in places, reddish and minutely scarcely viscid-pubescent, disc deeply trilobed, lobes oblong, sometimes tapering to an acute apex, rather less than 1 mm. long, yellowish or light green, achene with a small reddish apex scarcely beaked.

Senegal : 1838, *Heudelot* 662 (BM, K).

Sierra Leone : Nganyahun (Senihun to Njala), marsh, 26 Sept. 1935, *Deighton* 3048 (BR, K) ; near Rokon, Samu, in water in grass and sedge swamp, 4 Oct. 1951, *Jordan* 572 (K) ; Rokupr, Magbema, in damp soil at margin of tidal rice swamp, 24 Nov. 1951, *Jordan* 694 (K) ; Robumbe, Magbema, among thatch grass in flooded lateritic pan area, 14 Oct. 1952, *Jordan* 803 (K) ; Madino (Buya-Romende), wet place in swamp, 11 Aug. 1953, *Jordan* 913 (K).

Ubangi-Shari : Haut-Oubangui ; Marama, 30 km. south of Ippy, on gneiss rock on the margin of a pool, 3 Oct. 1927, *Tisserant* 2313 (P).

Belgian Congo : Wombali, Oct. 1913, *Vanderyst* 2232 (BR) ; Urundi, Mosso region, developing on the alluvial mud during the dry season, 5 Sept. 1951, *Michel & Reed* 280 (BR).

Angola : Pungo Andongo ; in the higher marshy wooded meadows of Pedra de Guinga and Matta de Quilanga, Feb., 1857, *Welwitsch* 7124b (LISU).

India, Japan

28. **Scleria tessellata** *Willd.*, Sp. Pl. 4 : 315 (1805) ; C. B. Clarke in Hook. f., Fl. Brit. Ind. 6 : 686 (1894), in part ; Cherm. in Humbert, Fl. Madag., Cyper. : 254 (1937).—" Ind. or.", Herb. *Willdenow* 17323, coll. *Rottler* ?

Scleria glandiformis Boeck. in Linnaea, 38 : 458 (1874) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 503 (1902) ; Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. 2 : 491, 493 (1936) ; Piérart in Lejeunia, Mém. 13 : 41, t. 2, fig. 6 (1953).—Nigeria, *Barter* 1042.

A medium-sized, rather densely tufted, glabrous or sparsely hairy annual, with a rather dense inflorescence. *Stems* 15–80 cm. tall, 1–2 mm. thick below, smooth throughout or sometimes scaberulous on the angles towards the terminal panicle. *Leaves* subbasal and somewhat higher, the basal ones reduced to almost bladeless and often vinaceous sheaths, shorter than the stems, 2–7 mm. wide, flat or flattish, usually glabrous and smooth except rather often hispidulous-scaberulous on the margins and sometimes the midrib towards the apex ; *sheaths* (lower) often pubescent especially from the mouth downwards, and on the basal short-bladed vinaceous ones, sheaths of the upper bracts often nearly glabrous, mouth truncate or convex by virtue of a marginal membranous development. *Panicles* 2–4, single at nodes, 2–6 cm. long, 1–2 cm. broad, longly to very longly spaced from one another, somewhat dense, terminal panicle sessile, lateral ones on peduncles scarcely to shortly exserted from the bract-sheaths. *Bracts* much longer than their panicles, sometimes overtopping the terminal panicle ; *sheaths* similar to those of the leaves. *Male spikelets* 5–6 mm. long. *Female glumes* more or less lanceolate, apex long-acuminate, 5–7 mm. long, glabrous, pale or whitish with reddish streaks, midrib often light green, not or slightly excurrent. *Achene* cylindric to ellipsoid, 3–3·5 mm. long, 1·9–2·2 mm. broad, finely longitudinally lacunose, with the longitudinal walls of the lacunae stouter than the transverse ones, glabrous, white or whitish, with a short stipe, disc deeply 3-lobed, lobes oblong-obovate, pale, thick, about 1 mm. long and rather less than 1 mm. broad, achene scarcely or extremely shortly beaked.

French Sudan : Koulikoro, 6–14 Oct. 1899, *Chevalier* 2468 (K) ; Kita Massif, lake at about 600 m., 27 Nov. 1943, *Jaeger* 1 (K).

Nigeria : Nupe, swamps, *Barter* 1042 (K) ; Minna Division ; roadside ditch 5 miles north of Minna, 4 Dec. 1949, *Meikle* 723A (K).

Ubangi-Shari : Haut-Oubangui ; Bozoum, among rocks, 15 Oct. 1931, *Tisserant* 2953 (P).

Chad Territory : Ham, R. Logone, 15 Nov. 1910, *Miss Macleod of Macleod* 151 (BM).

Anglo-Egyptian Sudan : Bahr el Ghazal Prov. ; 26 Oct. 1869, *Schweinfurth* 2389, in part (K) ; ibid., Rumbek, fenced paddocks, occasional, in *Hyparrhenia rufa* grassland, grey-black clay with some sand, 28 Oct. 1950, *Harrison* 1083 (K) ; ibid., Lakes District, Rumbek, near Akar Khor, same habitat as Harrison's plant, 28 Oct. 1951, *J. H. Davies* B.E.G.8 (K).

Angola : Pungo Andongo ; damp meadows on the banks of the Cuanza near Muta-Lucala, March 1857, *Welwitsch* 7123 (BM, LISU) ; ibid., in the higher marshy wooded meadows of Pedra de Guinga and Matta de Quilanga, Feb., between Caghay and Sansamanda, with *Isoetes aequinoctialis*, April and May 1857, *Welwitsch* 7124a (BM, LISU).

Nigeria : Northern Nigeria ; Zaria District, comm. Dec. 1930, *C. B. Taylor* 10 (EA, K).

India, Madagascar.

Welwitsch 7123, from Angola, has broadly ellipsoid achenes, with more square and deeper lacunae, but otherwise it agrees with *S. tessellata* and seems to belong here. It was misidentified by Ridley as *S. foliosa* Hochst. ex A. Rich. in Trans. Linn. Soc. Bot., ser. 2, 2 : 170 (1884).

29. **Scleria hildebrandtii** *Boeck.* in Flora, 63 : 454 (1880) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 505 (1902).—Kenya, *Hildebrandt* 2044.

A rather slender, glabrous annual, loosely tufted. *Rhizome* 0 or very short. *Stems* 30–45 cm. tall, 1–1·5 mm. thick, smooth, angles obtuse to acute and winged above. *Leaves* subbasal, lowest short-bladed, shorter than the stems, 3–6 mm. wide, flat or flattish, glabrous and smooth below, scaberulous on margins and midrib beneath towards the apex ; *sheaths* sometimes winged, glabrous, mouth truncate or slightly membranous and convex, glabrous or slightly villous. *Panicles* at 2–3 nodes, uppermost single, lower borne on 1–2 longly or very longly, often curved, glabrous and smooth, compressed with acute angles winged above, unequally exserted peduncles, panicles 1·5–3 cm. long, 1–1·5 cm. broad, at nodes longly to very longly spaced from one another, loose to somewhat dense. *Bracts* shorter to much longer than their panicles ; *sheaths* similar to the leaf-sheaths. *Male spikelets* 4·5–5 mm. long. *Female glumes* lanceolate or ovate-lanceolate, apex acuminate and acute, 5–6 mm. long, glabrous, pale with reddish streaks and castaneous patches, midrib sometimes excurrent up to 1 mm. long. *Achene* shortly cylindric or oblong-cylindric with a rounded apex, obtusely or obscurely trigonous, 3·5—4 mm. long, about 2·5 mm. broad, from almost smooth to slightly alveolate or wrinkled, glabrous, pale to whitish, disc with 3 lobes little developed, quadrate-orbicular, thick and spongy, stramineous below, reddish above and at the more or less truncate apex, apex of achene very shortly beaked.

Kenya : near Mombasa, Aug. 1877, *Hildebrandt* 2044 (BM, K).

Madagascar.

30. **Scleria clathrata** *Hochst. ex A. Rich.*, Tent. Fl. Abyss. 2 : 510 (1851) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 502 (1902).—Ethiopia, *Schimper* 1603.

A medium sized rather slender, nearly glabrous, loosely to rather densely tufted annual, with rather loose, nearly glabrous panicles. *Stems* 12–33 cm. tall, about 1 mm. thick, usually smooth on the lower, obtuse angles, sometimes scaberulous on the upper, acute angles. *Leaves* few, all subbasal (basal ones reduced to short-bladed sheaths), shorter or much shorter than the stems, 2–4 mm. wide, flat or flattish, glabrous and smooth, sometimes villous-scaberulous on 2 prominent nerves on the under-surface, margins smooth ; *sheaths* glabrous, mouth truncate or slightly membranous and convex, glabrous or slightly villous. *Panicles* 2–4, single or binate at nodes, 1–4 cm. long, 5–15 mm. broad, longly to very longly spaced from one another, loose, terminal panicle sessile, lateral ones on peduncles scarcely to longly exserted from the bract sheaths. *Bracts* very much longer than their panicles ; *sheaths* similar to those of the leaves, more often villous from the mouth downwards. *Male spikelets* 3·5–4·5 mm. long. *Female glumes* mostly ovate-lanceolate, apex long-acuminate, 5–7 mm. long, glabrous, pale or whitish with sometimes light brownish streaks, often light reddish-brown towards the apex, midrib greenish, not or slightly excurrent. *Achene* shortly oblong-ellipsoid, subcylindric, or oblong-subglobose, not or obscurely trigonous, 3–3·25 mm. long, 2–2·4 mm. broad, rather finely longitudinally lacunose, glabrous, pale or whitish, with a short stipe the apex of which is expanded

into a slightly trilobed, membranous, stramineous disc which is about 2 mm. in diameter, apex not tapering, scarcely or very shortly beaked.

Ethiopia : Walcha, wet plains on mountains, 10 Aug. 1841, *Schimper* 1603 (BM, P) ; Gafat, swampy meadows, 2460 m., 30 Sept. 1863, *Schimper* 1271 (BM) ; Begemeder, Senka Berr, mountain meadows, 7 Oct. 1863, *Schimper* 1236 (BM, K) ; near Woliss, 38°E. × 8° 30′ N., low lying marshy ground, on heavy black clay over volcanic rock, 2400 m., 5 Oct. 1954, *Mooney* 5852b (K).

31. **Scleria gracillima** *Boeck.* in Flora, 62 : 570 (1879) ; C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 505 (1902).—Anglo-Egyptian Sudan, *Schweinfurth*, Ser. III, 189.

An extremely slender glabrous annual or perennial. *Rhizome* probably 0, but lower part of plant absent. *Stems* up to over 30 cm., about 0·5 mm. thick, smooth. *Leaves* apparently situated on the lower part of the stem and probably shorter than the stems, between 1 and 2 mm. wide, flattish or more or less folded, glabrous and smooth except that margins are slightly scaberulous towards the apex ; *sheaths* sometimes winged, glabrous, mouth truncate or slightly concave. *Panicles* 2–3, subspiciform, extremely small and delicate, 1–2 cm. long, less than 1 cm. broad, longly or very longly spaced from one another, loose, lateral ones on very slender, compressed, peduncles, longly exserted from the bract-sheaths. *Bracts* longer than their panicles ; *sheaths* similar to the leaf-sheaths. *Male spikelets* about 3 mm. long. *Female glumes* more or less lanceolate, apex long-acuminate and acute, 4–4·25 mm. long, pale with reddish streaks, midrib sometimes very shortly excurrent. *Achenes* all crushed but apparently ellipsoid or subglobose, about 2·75–3 mm. long, about 2·25 mm. broad, smooth and glabrous, dull whitish, scarcely beaked, disc stramineous, shortly 3-lobed.

Anglo-Egyptian Sudan : Bahr el Ghazal, Agada, " sp. aromatica ", 20 Oct.1869, *Schweinfurth*, Ser. III, No. 189 (K).

32. **Scleria poaeformis** *Retz.*, Obs. 4 : 13 (1786).—India, *Koenig*.

Scleria oryzoides Presl, Reliq. Haenk. 1 : 201 (1828) ; C. B. Clarke in Hook. f., Fl. Brit. Ind. 6 : 691 (1894), et in Dyer, Fl. Trop. Afr. 8 : 505 (1902).—Philippine Is., *Haenke*.

Scleria coriacea G. Bertol. in Rendiconti Accad. Sci. Bologna, Ann. 1853–54 : 34 (1854), non Liebm. (1851).—Portuguese East Africa, *Fornasini*.

Scleria bertolonii Martens in Flora, 40 : 570 (1857).—New name for *S. coriacea* G. Bertol.

A very tall and stout-stemmed perennial with a thick, creeping rhizome and usually bearing a large single terminal ebracteate inflorescence. *Rhizome* about 5 mm. thick, reddish becoming blackish, horizontally creeping. *Stems* about 130–180 cm. tall, 3–10 mm. thick, including angles, below (clear of the sheaths), angles acute or even winged sometimes below, usually smooth but sometimes scaberulous, especially on the rhachis and its branches, rooting from nodes in water. *Leaves* basal or subbasal and 1–3 widely spaced higher on the stem, upper narrower and shorter bladed, all much shorter than the stems, 0·7–4 cm. wide, flat to revolute-plicate, scabrid on the margins and on the 3 prominent nerves towards the apex ; *sheaths* acute to winged and smooth to

scabrid on 3 angles, ligular zone reddish or vinaceous but not with membranous development, whole sheath or just the node reddish or vinaceous, mouth usually concave, sometimes more or less truncate. *Panicle* terminal, ebracteate or bract very small, setaceous, bracteoliform, several times branched and bearing very numerous spikelets, becoming dense, more or less elliptic in outline, 10–20 cm. long, 5–12 cm. broad. *Male spikelets* 3·5–4·75 mm. long. *Female glumes* ovate or ovate-acuminate, 3·5–5 mm. long, glabrous or sometimes very minutely scurfy-setulose in places, nut-brown or stramineous with dark brown streaks and patches, midrib sometimes excurrent up to 0·5 mm. long. *Achene* ovoid or ellipsoid, 3·5–3·75 mm. long, 2–2·8 mm. broad; smooth and glabrous, white or whitish, shortly 3-lobed, lobes tapering, apex of achene scarcely beaked.

TANGANYIKA : Mafia Island ; Mwakuni, local or locally dominant with *Cyperus* in shallow fresh water lakes, nearly sea-level, 7 Aug. 1937, *Greenway* 5016 (K).

ZANZIBAR : Zanzibar Island ; [recd. April 1867 and Sept. 1868], *Kirk* 4 (K). Pemba Island ; *J. H. Vaughan* 768 (K).

This species has the essential characters which justify its inclusion in this section but its very wide leaves and more or less terminal ebracteate inflorescence distinguish it sharply from its African allies. This inflorescence, incidentally, reminds one, perhaps in an indefinable way, of that of *S. poaeoides* Ridley in Sect. *Hypoporum*. Its claim to inclusion in the African flora rests upon its occurrence on the islands of Zanzibar, Pemba and Mafia, and it has also been collected at Mozambique if Clarke's placing of *S. coriacea* G. Bertol. as a synonym of *S. oryzoides* Presl is correct. Fornasini's plant, on which *S. coriacea* is based, has not been seen by me and it was probably destroyed in the second world war.

Scleria complanata Boeck. in Flora, 1879, p. 571.—I have not seen any specimens of this and it is impossible to identify it with certainty from the original description. C. B. Clarke saw the Berlin sheet when preparing the account of the genus for the Flora of Tropical Africa, and although he expressed the opinion that it was " perhaps only a variety of *S. foliosa* or *S. glandiformis* ", he placed it on the next page between *S. nyasensis* C. B. Clarke and *S. schimperiana* Boeck. The Berlin specimen was presumably destroyed in the second world war.

Sect. 4. **Hypoporum** (*Nees*) *Endl.*, Gen. Pl. 112 (1836).

Hypoporum Nees in Journ. Edinb. Phil. Soc. 17 : 266 (1834) et in Mart., Fl. Bras. 2 (1) : 169 (1842).

Slender plants with narrow *leaves* which are not suddenly narrowed above. *Spikelets* androgynaeceous and male, in terminal glomerate-spicate inflorescences. *Bracts* (except in *S. lithosperma*) 0. *Hypogynium* not or scarcely developed.

An account of the African species belonging to this Section was published in the Kew Bulletin in 1955 (Notes on *Cyperaceae* XXXVIII).

A NEW SPECIES OF CNESTIS (CONNARACEAE) FROM WEST TROPICAL AFRICA.

F. N. Hepper

Cnestis tomentosa *Hepper* sp. nov. [Sect. *Brevipetalae* Schellenb.] ; affinis *C. mannii* (Bak.) Schellenb. sed foliolis angustioribus subtus dense tomentosis differt.

[*C. mannii* non (Bak.) Schellenb.—Hutch. et Dalz., F.W.T.A. **1** : 515 (1928) et Schellenb. in Engl. Pflanzenr. 4, 127 : 34 (1936), pro parte quoad *Staudt* 916.]

Frutex scandens ad 30 m. altus. *Ramulis* juventute viridibus sed fulvo-tomentosis, maturitate fulvis. *Folia* imparipinnata, (3-)4-juga ; rhachis 14–18 cm. longa, densissime tomentosa ; foliolum terminale chartaceum rigidum, ovato-ellipticum, basi subcuneatum vel obtusum, apice acutum vel subacuminatum, 11–15 cm. longum, 5–7·5 cm. latum, supra glabrum, subtus dense tomentosum costa supra impressa tomentosa, nervis lateralibus 11–13-jugis subtus fulvo-tomentis ; foliola lateralia inaequalia ad rhacheos basin diminuentia, superiora oblonga vel elliptico-oblonga, 5–13 cm. longa, 2·5–5 cm. lata, basi rotundata, apice acuminata. *Panicula* terminalis, laxa, 15–20 cm. longa, densissime tomentella. *Sepala* 5, linearia, 6 mm. longa extra tomentosa intus puberula. *Petala* 5, fulvo-viridia, oblonga, 2·5 mm. longa, intus glabra, extra ad basin adpresso-pilosa, apice subacuta. *Stamina* 10, subaequalia, 2·5 mm. longa. *Carpella* 5 ; styli 6 mm. longi ; ovaria villosa. *Fructus* ignotus.

British Cameroons : Kumba Div., S. Bakundu Forest Reserve, near Banga, in high forest, fl. 21 Mar. 1948, *Onochie & Brenan* 9328 (K, holotype) : liane to about 100 ft. high ; young shoots green, ridged with pale brown indumentum, older stems brown, leaf rhachides brown ; leaflets thickly and stiffly papery, mid-green and not very glossy above, midrib impressed, pale rather glaucescent green with brown midrib and lateral nerves beneath ; flowers greenish-brown. Kumba Div., Johann-Albrechtshöhe *Staudt* 916 (BM).

Closely related to *C. mannii* but with softly tomentose indumentum on the leaflets beneath, instead of the very short appressed hairs of that species. The leaflets also appear to be usually in (3-)4 pairs and are oblong or ovate-elliptic at the most. *C. mannii* has 1–3 pairs of leaflets which are ovate to suborbicular with a longer and more abruptly acuminate apex.

In Schellenberg's account of *C. mannii* in Engl. Pflanzenreich 4, 127 : 34 (1936), he gives to the species several characters which are not observable on the type (*Mann* 2264) or on *Talbot* 1707. It must have been from *Staudt* 916 (BM) that he observed the " villous " nature of the leaflets Schellenberg also states that the petals of *C. mannii* are glabrous, which appears to be erroneous. *Staudt* 916, in fact, belongs to our new species.

C. tomentosa falls into the very small and distinct subsect. *Brevipetalae* Schellenb. on account of its extremely short petals compared with the calyx, and next to *C. mannii* because of the hairy petals. The indumentum of the leaflets, although much denser in our species, is similar to that of *C. grandifoliolata* De Wild., but *C. tomentosa* differs from that species (which has 7–8 lateral nerves) in having more numerous leaflets and lateral nerves.

NEW TAXA OF PAPILIONACEAE FROM WEST TROPICAL AFRICA.

F. N. Hepper

During the preparation of an account of the Papilionaceae for the revised edition of Hutchinson and Dalziel's *Flora of West Tropical Africa*, several new taxa have been worked out. These are now described and a few notes on other species are also added.

Crotalaria occidentalis *Hepper* sp. nov. [Sect. *Simplicifoliae* Benth.] ; affinis *C. glaucae* Willd. sed planta paludicola ; pubescentia diversa et floribus longius pedicellatis differt. (Fig. 1).

Herba annua palustris ; caulis adscendens, diffusus, 20–50 cm. altus ; ramuli tenues, foliosi, pubescentes. *Radix* tenuis, fibrosa. *Folia* 1-foliolata ; foliola subsessilia, oblonga, basi et apice rotundata, (7–) 10–22 mm. longa, 3–4 mm. lata, supra glabra, subtus adpresso-pubescentia. *Stipulae* subulatae, 1 mm. longae. *Inflorescentia* uniflora. *Pedicelli* filiformes, 1–2 cm. longi, basi bracteis 2 lanceolatis praediti, superne articulati, bracteolis 2 subulatis. *Calyx* c. 4 mm. longus, bilabiatus, 5-lobatus, adpresso-pubescens. *Corolla* rubra et flava ; vexillum ellipticum, basi breviter unguiculatum et bicallosum, apice leviter cucullatum, obtusum, 5 mm. longum ; alae oblongae, 5 mm. longae ; carina ovata, 5 mm. longa. *Ovarium* cum stylo glabrum. *Legumen* oblongum, 1·4 cm. longum, glabrum, glaucescens, breviter stipitatum, inflatum ; semina c. 10, reniformia, nitida, spadicea.

Portuguese Guinea : Bissau Prov., Antula, fl. 11 Dec. 1942, *Espirito Santo* 1427 (K) : erva anual difusa nos capinais dos terrenos húmidos ou alagados na época pluviosa, flores amarelas. Bafatá, fl and fr. 28 Dec. 1950, *Espirito Santo* 2858 (K) : erva anual dos terrenos húmidos, alagaveis na época das chuvas ; flores amarelas riscadas de vermelho.

Sierra Leone : N. Prov., Bombali Dist., Sanda Tenraran Chiefdom, Rowankili boli near Mateboi, amongst rice on flooded grassland now dry, fl. and fr. 27 Nov. 1952, *Jordan* 826 (K, holotype) : flowers red and yellow.

This is probably synonymous with *C. uniflora* J. G. Baker in F.T.A. **2** : 13 (1871) based on a Perrottet specimen from Senegal. E. G. Baker failed to find it for his monograph of African *Crotalaria* and merely repeated the description in Latin, whilst in F.W.T.A. ed. 1 it was left as an imperfectly known species. Mr. R. W. J. Keay kindly searched both the general collection and the W. African collection in Paris in 1955, but could not locate the Perrottet specimen. However, the name *C. uniflora* cannot be used as it is a later homonym of *C. uniflora* Koen. ex Roxb. [Hort. Beng. 98 (1814), nomen nudum] Fl. Ind. **3** : 271 (1832). A new name and type has therefore been chosen to avoid confusion. Comparison of J. G. Baker's description of his *C. uniflora* with our new material shows one discrepancy in that his specimen was glabrous, otherwise it agrees very well.

Crotalaria deightonii *Hepper* sp. nov. [Sect. *Simplicifoliae* Benth.] ; affinis *C. sparteae* Bak. pro parte sed foliola breviter petiolulata, pedicelli longiores, vexillum latius ; affinis *C. psammophilae* Harms sed legumine sessili, glabro, vexillo latiore differt.

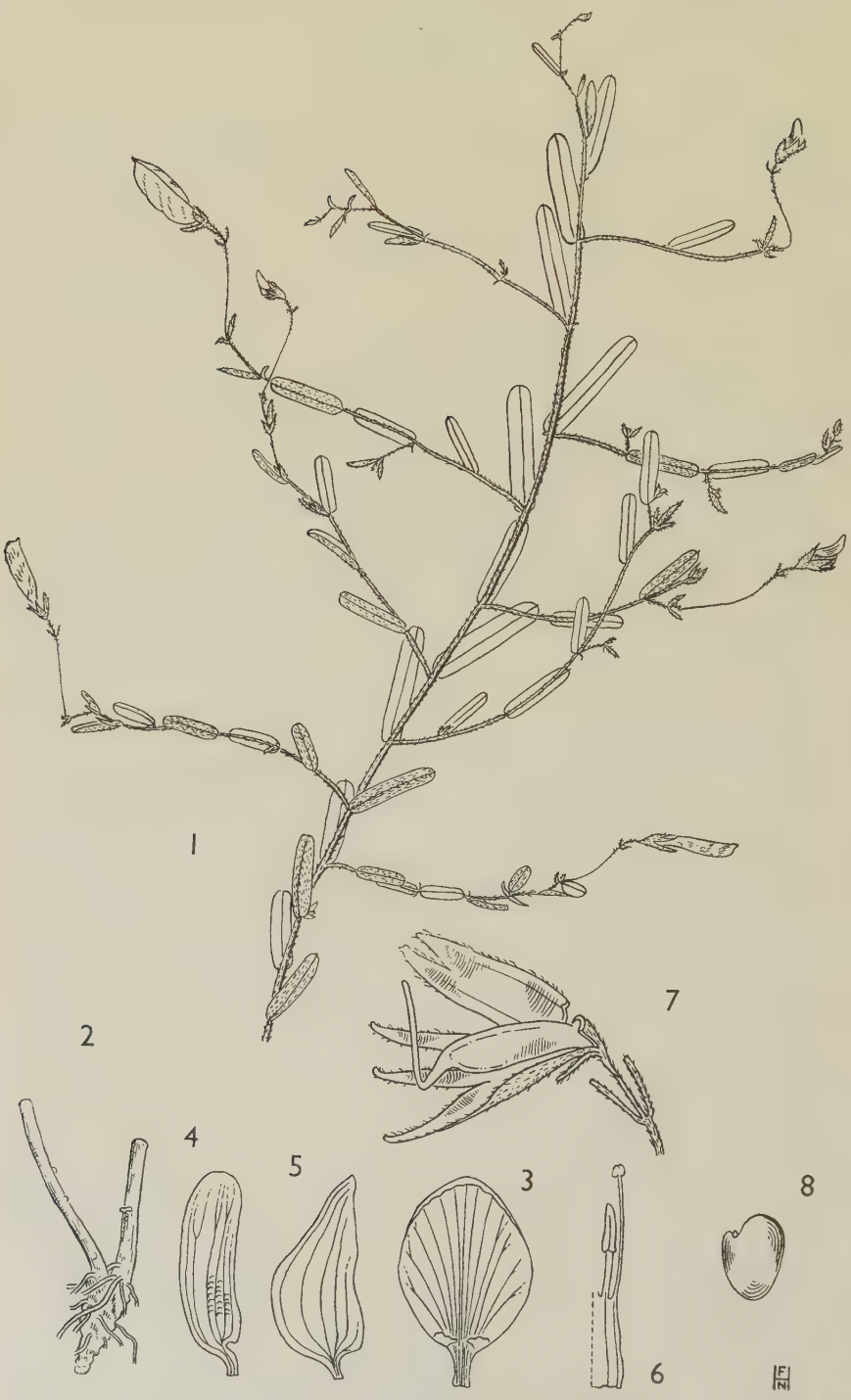

FIG. 1. *Crotalaria occidentalis* Hepper. 1, a branch, × 1 ; 2, rootstock, × 1 ; 3, standard × 5 ; 4, wing, × 5 ; 5, keel, × 5 ; 6, stamens, × 5 ; 7, ovary and calyx, × 8 ; 8, seed, × 12. Drawn from *Jordan* 826, Sierra Leone.

[*C. spartea* R. Br. [Planch.] ex Bak. in F.T.A. **2** : 12 (1871), pro parte quoad *Afzelius* s.n. ; J. Linn. Soc. Bot. **42** : 262 (1914), pro parte ; Hutch. et Dalz., F.W.T.A. **1** : 398 (1928).]

Herba (? annua) erecta ramosa ad 2 m. alta. *Radix* sublignosus, prope terram. *Caules* graciles, glabrae, virides, striatae, teretes, superiore parte ramosae. *Stipulae* subulatae, 3 mm. longae, caducae vel carentes. *Petioluli* 2–4 mm. longi. *Folia* 1-foliolata ; foliola anguste linearia, 5–12 cm. longa, 2–3 mm. lata, costis subtus prominulis, glabris. *Racemi* pauciflores laxi, diffusi, terminales et axillares, 6–10 cm. longi. *Bracteae* basi pedicellorum subulatae 3 mm. longae, inferiores steriles. *Bracteolae* ad basin calycis subulatae, 2 mm. longae. *Pedicelli* 8–10 mm. longi. *Calyx* aequaliter e medio 5-dentatus, in toto 4–5 mm. longus. *Corolla* lutea, striis prominulis caeruleis obtecta, glabra, minutissime glanduloso-punctata. *Vexillum* ovatum, apice obtusum, basi subcordatum, 10 mm. longum, 8 mm. latum, breviter unguiculatum, puberulum. *Alae* oblongae, 7 mm. longae, 2·5 mm. latae. *Carina* ad basin ciliata, 8 mm. longa, 6 mm. lata. *Ovarium* glabrum ; stigma applanatum ciliatum. *Legumen* cylindricum, 3·5 cm. longum, 5 mm. latum, glabrum, multi-seminatum. *Semina* nitida, pallido-fulva, reniformia, ad hilum excavata, 3 mm. lata.

Sierra Leone : Without locality, *Afzelius* (BM). N. Prov., Bombali Dist., Sanda Tenraran Chiefdom, Makali, 13 Oct. 1928, *Glanville* 11 (K). Port Loko Dist., Loko Masama Chiefdom, Bundulai, in orchard bush savannah, not uncommon, fl. and fr. 26 Nov. 1951, *Deighton* 5664 (K, holotype) : flowers yellowish, heavily streaked purple.

Planchon gave the manuscript name *Crotalaria spartea* to a specimen gathered by Afzelius in Sierra Leone, but although Baker (1871) published Planchon's name (which he attributed to R. Brown) he must have used the other specimen he cited (*Welwitsch* 1948, from Angola) for the description, as he says that the species has sessile leaves. I therefore designate *Welwitsch* 1948 as the lectotype of *C. spartea* Planch. ex Bak. Afzelius' specimen has only one complete leaf, but the fracture at the base of the lamina indicates a short petiolule which is also seen in other more recently collected material of *C. deightonii*.

The new species is closely related to *C. psammophila* Harms, from southern tropical Africa, which has stipitate and pubescent fruits, shorter pedicels and narrower standard petal. *C. stuhlmannii* Taub. differs from *C. deightonii* by the appressed-pubescent leaves, stems and calyx, shorter calyx and pedicel and by the longer petiolule.

Crotalaria mortonii *Hepper* sp. nov. [Sect. *Chrysocalycinae* Benth.] ; affinis *C. macrocalyci* Benth. sed calycis pilis brevioribus et robustioribus, bracteolae subulatis minoribus foliis semper 3-foliolatis (nec foliis uni-foliolatis interspersis), foliola oblanceolata vel obovata differt.

[*C. macrocalyx* (non Benth.)—Hutch. et Dalz., F.W.T.A. **1** : 397 (1928), pro parte, quoad *Mildbraed* 7410.]

Suffrutex ± erectus ramosus c. 1 m. altus. *Caules* lignosi, adpresso-pilosi, teretes. *Stipulae* lineari-lanceolatae, falcatae, 4–6 mm. longae, persistentes. *Folia* subsessilia, semper 3-foliolata ; foliola oblanceolata vel oblonga, ad basin cuneata, apice subacuta vel rotundata-mucronata, 3–5 cm. longa, 5–13 mm. lata, subtus pilis dense obtecta, supra glabra. *Inflorescentia* capitata, ad apices caulium et ramorum disposita, capitula

floribus 2–3 (–4) instructa. *Bracteae* lanceolatae, 8 mm. longae. *Bracteolae* subulatae, 5 6 mm. longae, saepe reflexae. *Pedicelli* c. 6 mm. longi, crassi. *Calyx* bilabiatus, 5-lobatus, accrescens, 15–16 mm. longus (floribus), 20 -21 mm. longus (fructibus), extra dense pilosus, pilis brevibus robustis eis fructus similibus. *Corolla* primo flava, maturitate lutea, calyce inclusa. *Vexillum* suborbiculatum 13–15 mm. longum, extra ad partem median pubescens, unguiculo brevi. *Alae* oblongae 13–15 mm. longae, 6–9 mm. latae, glabrae. *Carina* 13–15 mm. longa, 7–8 mm. lata, tota glabra marginibus superioribus et inferioribus solum exceptis. *Ovarium* pilosum ; ovula c. 6 ; stylus ad basin glaber, ad apicem minuto-pubescens, stigma apice crinibus coronatum. *Legumen* ovatum, 1·2 cm. longum, 1 cm. latum, densissime patenter pilosum ; semina 4–5 (–6), 3·5 mm. longa, reniformia, rubentia, rugosa.

Gold Coast : Northern Territories, Gonja, near Lake Sorri ; fl. and fr. 16 Dec. 1953, *Morton* GC 25033 (K, holotype ; GC) : flowers yellow, turning orange-brown on fading, standard veined in the centre ; more or less erect.

French Togoland : Atakpamé, fl. Nov. 1913, *Mildbraed* 7410 (K).

In the description the larger size of petals is taken from *Mildbraed* 7410.

C. mortonii differs from *C. macrocalyx* Benth. by the shorter stouter hairs on the calyx which are similar to those on the mature fruit, the smaller bracteoles and by the consistently 3-foliolate leaves.

Crotalaria confusa *Hepper* sp. nov. [Sect. *Chrysocalycinae* Benth.] ; affinis *C. macrocalyci* Benth. sed caulibus pilosis, pilis patentibus vel reflexis vestitis, bracteolae et flores minoribus, folia semper 3-foliolata (nec foliis 1-foliolatis interspersis), foliola oblanceolata vel obovata differt.

[*C. macrocalyx* (non Benth.)—Hutch. et Dalz., F.W.T.A. **1** : 397 (1928), pro parte, quoad *Bailey* 6, *Brown-Lester* s.n. et *Dalziel* 16.].

Herba ± procumbens vel diffusa, sublignosa, 0·5–1 m. alta. *Radix* sublignosa, simplex. *Caules* pilosi, pilis patentibus vel reflexis vel tomentosis, teretes. *Stipulae* lineari-lanceolatae, 3 mm. longae, reflexae, persistentes. *Folia* subsessilia, semper 3-foliolata ; foliola oblanceolata vel obovata, ad basin cuneata, apice rotundata et minute mucronata, 1·5 - 3 cm. longa, 5–12 mm. lata, subtus pilis dense obtecta, supra glabra. *Inflorescentia* capitata, ad apices caulium et ramorum disposita, capitula floribus 2–4 instructa. *Bracteae* lineares, 5 mm. longae, persistentes. *Bracteolae* lineares, 6 mm. longae. *Pedicelli* breves, 2 mm. longi. *Calyx* bilabiatus 5-lobatus, accrescens, 11–12 mm. longus (floribus), 15–17 mm. longus (fructibus), extra villosus, pilis calycis eis fructus discrepantibus. *Corolla* flava vel lutea, calyce inclusa. *Vexillum* elliptico-orbiculatum, c. 9 mm. longum, c. 11 mm. latum. extra glabrum vel sparsissime villosum. *Alae* oblongae, c. 9 mm. longae, 4 mm. latae, glabrae. *Carina* 9 mm. longa, 4·5 mm. lata, glabra. *Ovarium* pubescens ; stylus ad apicem pubescens. *Legumen* ovatum, 9 mm. longum, 7 mm. latum, densissime patenter pilosum ; semina 6–7, reniformia, 3 mm. longa, rubentia, rugosa.

Gold Coast : Northern Territories, Tamale, fl. Nov. 1928, *Lloyd Williams* 418 (K) : grows 2–3 ft. high ; flowers dark buff coloured ; small reddish seeds ; very common in dry season, may be suitable as cover-crop. Tamale, Dr. Griffith's bungalow No. 2, fl. 26 Nov. 1935, *Akpabla* 360 (K) : straggling herb spreading on the ground, leaves oblanceolate, flowers pinkish-yellow. Tamale, on margin of millet field, fl. and fr. 5 May 1950, *Adams & Akpabla* GC 4152 (K) : flowers deep yellow. Tamale R.H., guinea-corn-

field, fl. and fr. Dec. 1951, *Morton* GC 6216 (K, holotype) : flowers rich yellow, tipped with reddish-purple. Tamale, cultivated land, fl. 27 Mar. 1953, *Morton* GC 8779 ; straggling woody shrub ; flowers orange, veined brick-red. Gonja, in cultivated land, fl. and fr. 17 Dec. 1953, *Morton* GC 25035 (K) : procumbent, flowers orange.

British Togoland : Kpeve Agricultural Station, used as a green manure, fl. and fr. Jan. 1932, *Irvine* 1739 (K) : a bushy herb up to 1 ft. high, leaves trifoliolate, flowers bright orange.

Northern Nigeria : Bauchi Prov., Katagum Dist., fl. and fr. 29 Nov. 1907, *Dalziel* 16 (K). Ilorin Prov., Ilorin *Bailey* 6 (K) : a common shrub with yellow flowers. Ilorin, Share suburb, in farm, fr. 8 Jan. 1952, *Ejiofor* FHI 30802 (K). Niger Prov., Mokwa Dist., roadside, wasteland at edge of farm, fl. and fr. 29 Nov. 1950, *Mutch* FHI 27955 (K) : herb, quarter creeping, semi-woody, flowers bright yellow. Niger Prov., Nupe Country, 1906–7, *Yates* s n. (BM). Niger Prov., Kuta Dist., Gwada, in farms, *Lamb* FHI 3206 (FHI) : herb 6–12 in. high.

Western Nigeria : Oyo Prov., Ogbomosho *Rowland* s.n. (K).

North Cameroons (probably French) : Oct. 1910 *Talbot* s.n. (BM).

This species is distinguished from *C. macrocalyx* Benth. by the more or less tomentose stems with the hairs erect or reflexed, the smaller flowers, the fewer-flowered inflorescences and by the leaf characters as described above. Herbarium sheets have frequently been named *C. perrottetii* Guill. & Perr., but that species has a pubescent keel and villose fruits, instead of the glabrous keel and the very dense mass of erect hairs on the fruits of *C. confusa*. It differs from *C. mortonii* Hepper in the smaller flowers and different hairs on calyx and fruit.

Variations of C. confusa.

Crotalaria confusa and *C. mortonii* are closely related to *C. macrocalyx* Benth. and the three species are part of a complex aggregate with other members of the section *Chrysocalycinae* Benth., such as *C. perrottetii* DC. and *C. ebenoides* (Guill. & Perr.) Walp., which are more distinct. Study of the herbarium material at Kew and the British Museum has shown that true *C. confusa*, and especially *C. mortonii*, may be separated from true *C. macrocalyx* with comparative ease. There is, however, a mixed residue of specimens which one would hesitate to name with any degree of certainty. This is a group which experimental taxonomy and field observations would undoubtedly help to elucidate. The residue of specimens may be roughly subdivided on several characters, but it would indeed be rash to describe them as infraspecific taxa on the present information as they are by no means uniform. The following scheme, however, may act as a guide to some later research worker.

The flowers are larger than *C. confusa* var. *confusa*, 15–18 mm. long ; leaves all 3-foliolate, tending to obovate :

Leaflets oblong-oblanceolate :

Stem hairs more or less erect (i.e. at right angles to the stem) :

Gold Coast : Gambaga Hill, *Morton* GC 8979 (K). Savelugu, *Morton* GC 9864 (K).
Northern Nigeria : Nupe *Barter* 959 (K). Jebba *Meikle* 678 (K).
British Cameroons : Bama, Dikwa Div. *McClintock* 9 (K).

Stem hairs more or less appressed and rather long :

French Niger : Niamey *Hagerup* 467 (BM).
Northern Nigeria : Abinsi *Dalziel* 595 (K).

Leaflets linear-oblong :

Stem hairs more or less erect :

French Niger ? : without locality *Hagerup* 684 (BM).

Stem hairs more or less appressed and rather long :
NORTHERN NIGERIA : Abinsi *Dalziel* s.n. (BM). Sokoto *Lely* 128 (K).

Crotalaria Sect. *Sphaerocarpae* Benth.

Some difficulty is encountered when attempting to name W. African species of this section from E. G. Baker's monograph of the African species of *Crotalaria* in Journ. Linn. Soc., Bot. **42** : 241 (1914). Part of the trouble is due to a mixture of specimens being cited.

It is hoped that a clearer idea of the W. African species may be obtained from the following key and notes :

Stipules absent ; mature fruits on erect pedicels :

Perennial ; flowers 7 mm. long ; fruits subglobose, 5 mm. long, pubescent ; leaflets broadly obovate, 8–15 mm. long, 4–7 mm. broad, emarginate at apex ; tufted habit, stems arising at ground-level from a stout rootstock . . . . . 1. *graminicola*

Annual ; flowers 5 mm. long ; fruits globose, 4 mm. long, pubescent ; leaflets oblanceolate, 4–11 mm. long, 2–3 mm. broad, rounded and mucronate at apex ; erect habit, branching well above ground-level, stem from a slender rootstock . . 2. *hyssopifolia*

Stipules present, small ; mature fruits on deflexed pedicels :

Plant pubescent to pilose with brown hairs ; flowers 6–7 mm. long ; widely spread in tropical Africa . 3a. *sphaerocarpa* ssp. *sphaerocarpa*

Plant glabrous in all parts ; flowers 5 mm. long ; in Senegal 3b. *sphaerocarpa* ssp. *polycarpa*

1. **C. graminicola** *Taub. ex Bak. f.* in Journ. Linn. Soc., Bot. **42** : 291 (1914).

C. diloloënsis Bak. f. in Rev. Zool. & Bot. Afr. **21** : 297 (1932).

C. praecox Milne-Redhead in Hook. Ic. Pl. **33** : t. 3244 (1934).

Heudelot 614 cited here by E. G. Baker is referred to the next species.

2. **C. hyssopifolia** *Klotzsch* in Peter's Mossamb. Bot. **1** : 55 (1862). West African plants of this species have been confused with *C. graminicola* (*Heudelot* 614) and *C. sphaerocarpa* var. *angustifolia* (*Scott Elliot* 4310) by E. G. Baker. At first sight they appear dissimilar from the *C. hyssopifolia* of Mozambique (the type locality) which has longer inflorescences, more densely pubescent stems, shorter pedicels and lower branching. Material from Uganda and Eastern Sudan shows a close affinity with plants from Sierra Leone and French Guinea, but there is a gradation as well into the plants from Tanganyika and Mozambique, which are more characteristic of the type specimen of *C. hyssopifolia*. Seeds of specimens from Senegal and Sierra Leone and some of those from Uganda are longer than seeds from Mozambique and bear a caruncle at the hilum, but this is not an absolute distinction.

3a. **C. sphaerocarpa** *Perr. ex DC.* De Candolle described this species (1825) from a specimen and notes sent to him by Perrottet. The original description and Guillemin and Perrottet's subsequent one

(1832) both indicate that the species is pubescent. The type specimen (*Perrottet* 132), kindly lent by the Muséum National d'Histoire Naturelle, Paris, is markedly pubescent and matches the Kew specimens collected by Roger and Thierry also from Senegal. The British Museum, however, contains a plant (*Perrottet* 171) which is quite glabrous (see 3b below).

The name *C. sphaerocarpa* var. *angustifolia* Hochst. appeared on duplicate labels of *Kotschy* 282, but it was not validated until E. G. Baker published a description in 1914. However, Bentham (1843) had previously described *Kotschy* 282 as a new species, *C. nubica*. These differed from *C. sphaerocarpa* in the supposedly narrower leaflets, but as leaf-shape is a very variable character it is not proposed to maintain the separate taxon.

The following is the proposed synonymy for most of the synonyms of ssp. *sphaerocarpa* from which may well be separated good varieties or taxa below subspecies rank :—

C. sphaerocarpa *Perr. ex DC.* Prod. **2** : 133 (1825) ; Guill. et Perr. Fl. Seneg. **1** : 167 (1832) ; Bak. f. in Journ. Linn. Soc., Bot. **42** : 289 (1914), partly, excl. *Perrottet* 171, *Heudelot* 483.

C. sphaerocarpa Perr. ex DC. var. *angustifolia* Hochst. ex Bak. f. l.c. (1914), partly, excl. *Sc. Elliot* 4310.

C. sphaerocarpa Perr. ex DC. var. *lanceolata* Schinz in Abh. Bot. Ver. Brand **30** : 160 (1888) ; Bak. f. l.c. 290.

C. nubica Benth. in Hook. Lond. Journ. Bot. **2** : 581 (1843) ; Bak. f. l.c. 289.

C. nutans Welw. ex Bak. in F.T.A. **2** : 24 (1871) ; Bak. f. l. c. 284.

C. squarrosa Schinz in Mém. Herb. Boiss. **1** : 130 (1900) ; Bak. f. l.c. 292.

Distribution : Senegal, N. Nigeria, Eastern Sudan, Tanganyika, N. & S. Rhodesia, Mozambique, Bechuanaland, Transvaal, Orange Free State and Angola.

3b. **C. sphaerocarpa** *Perr. ex DC.* ssp. **polycarpa** (*Benth.*) *Hepper* stat. nov.

C. polycarpa Benth. in Hook. Lond. Journ. Bot. **2** : 580 (1843).

C. sphaerocarpa in syn., partly—Bak. in F.T.A. **2** : 23.

C. polycarpa Benth. (1843) was based on a glabrous plant (*Heudelot* 483) which was later sunk under *C. sphaerocarpa* in the Flora of Tropical Africa (1871). In view of the distinct regional distribution of these glabrous plants it is proposed to place them in the rank of subspecies. It is into this sub-species that *Perrottet* 171 (mentioned above, 3a) may be placed.

Senegal : *Perrottet* 171 (BM). Cayor *Heudelot* 483 (K, holotype). Dakar *Rattray* (P ; K). Cape Verde *Talmy* (P ; K). M'Bao near Dakar, 13 Nov. 1949, *Th. Monod* (IFAN). Hann, Oct. 1950, *Berhaut* 1150 (P).

Easily distinguished from ssp. *sphaerocarpa* by being entirely glabrous. Its distribution is very local in Senegal around Cape Verde.

Crotalaria bamendae *Hepper* sp. nov. [Sect. *Sphaerocarpae* Benth.] ; affinis *C. nyikensi* Bak. sed stipulis conspicuis, petiolo breviore, foliolis latis differt.

Herba vel suffrutex erecta, ramosa, ad 60 cm. alta. *Caules* dense pilosi. *Stipulae* lanceolatae, acutae, subfalcatae, reflexae, 4–5 mm. longae, 1–1·5 mm. latae, pilosae. *Folia* 3-foliolata, subsessilia, petiolo communi 3–5 mm. longo obtecta. *Foliola* omnia similia, angusto-elliptica vel elliptica vel obovato-elliptica, 1·5–2 cm. longa, 6 7 mm. lata, apice subacuta, ad basin cuneata, utrinque pilosa, subtus pilis argenteis et sericeis ornata. *Inflorescentia* terminalis, 1·5–3 cm. longa, flores lutei, in capitula dense aggregati. *Bractae* lanceolatae, 5 mm. longae. *Pedicelli* 4 mm. longi. *Calyx* bilabiatus, profunde 5-lobatus, 4 mm. longus, extra longo-pilosus. *Vexillum* suborbiculare, unguiculo intus pubescenti, in toto 6 mm. longum. *Alae* falcatae, 5–6 mm. longae. *Carina* 5 mm. longa, 3 mm. lata sinu laterali praedita. *Ovarium* pilosum ; ovula 2 ; stylus ad basin glaber, ad apicem barbatus. *Legumen* maturum non visum.

British Cameroons : Bamenda Dist., Bamenda Govt. Station, farmland, 19 Dec· 1951, *Egbuta* FHI 3763 (K) : herb about 2 ft. high ; leaves have silvery undersurfaces, but their upper surfaces are green ; leaves and stems are hairy. Bamenda Dist., Banso (Kumbo), roadside in association with grass on basalt-derived soils, 16 Oct. 1947, *Tamajong* FHI 23479 (K, holotype) : small bushy shrub ; stems and leaves covered with soft silvery-white hairs ; leaves deeper green on upper surface ; flowers yellow with fine dark lines on the standard.

Neither of our specimens of *C. bamendae* has ripe fruits, but the ovary being 2-seeded is a sure indication that the species belongs to Sect. *Sphaerocarpae*. Its nearest relative appears to be *C. nyikense* from Nyasaland which lacks stipules and has longer petioles.

C. intermedia *Kotschy*. Hitherto this has been confused with *C. ochroleuca* G. Don, but E. G. Baker and Miss Hillcoat in Exell Cat. Vasc. Pl. S. Tomé 152 maintain them as distinct species. Wilczek in Fl. Congo Belge **4** : 221 also separates them, stating that the distribution of the two species is imperfectly known.

It is now possible to give a more accurate list of tropical African countries in which each species occurs, from examination of ample material at Kew and the British Museum.

C. intermedia Kotschy in Sitzungsb. Acad. Wien 362, t. 3, (1864) : N. Nigeria, Eastern Sudan, Uganda, Kenya, Tanganyika and Belgian Congo.

C. ochroleuca G. Don Gard. Dist. **2** : 138 (1832) : Senegal (?), Portuguese Guinea, French Sudan (?), Sierra Leone, Liberia, Ivory Coast (?), Gold Coast, N. Nigeria, S. Nigeria, British and French Cameroons, Ubangi-Shari, Eastern Sudan, Abyssinia, Uganda, Tanganyika, N. & S. Rhodesia, Belgian Congo, Angola and S. Tomé. The question marks indicate a record in the literature for *C. intermedia* that are most likely to be *C. ochroleuca*, but the specimens concerned have not been verified.

Millettia leonensis *Hepper* sp. nov. [Sect. *Afroscandentes* Dunn] ; affinis *M. barteri* (Benth.) Dunn sed vexillo et legumini densissime spadiceo-sericeis, foliolis minoribus acutis, stipellis persistentibus differt. (Fig. 2).

Frutex scandens, cortice glabro lenticellato, ramis primo castaneo-pubescentibus. *Stipulae* lanceolatae, 2 mm. longae, caducae. *Folia* 7-foliolata ; rhachis tenuis, 4–10 cm. longa ; foliola ovata vel obovato-

FIG. 2. *Millettia leonensis* Hepper. 1, flowering shoot, × ⅔; 2, young fruit, × ⅔; 3, standard, × 2; 4, keel, × 2; 5, wing, × 2; 6, stamens, × 2; 7, ovary, × 2; 8, calyx split down one side and opened out, × 2; 9, detail of leaf surface beneath, × 2. Drawn from *Deighton* 4926.

elliptica, 4–9 cm. longa, 1·5–4 cm. lata, basi (in foliolis lateralibus) rotundata vel (in foliolo terminali) cuneata, apice acuminata acuta et mucronata (costa excurrente). *Stipellae* subulatae, 3 mm. longae, persistentes. *Inflorescentia* racemosa, rhachide 9–33 cm. longa, spadiceo-pubescente. *Flores* in pedunculo 3–5 mm. longo congesti, pedunculis inter se c. 8 mm. distantibus. *Pedicelli* 3–4 mm. longi, superne bracteolis 2 caducis praediti. *Calyx* 5-dentatus, densissime spadiceo-pubescens. *Corolla* purpurea ; vexillum obovatum, apice emarginato, 14 mm. longum, 11 mm. latum, intus glaber sed unguiculo dense pubescente extra densissime spadiceo-seriseo ; alae oblongo-ellipticae, 14 mm. longae, 4 mm. latae, pubescentes ; carina 13 mm. longa, 5 mm. lata, nervis pubescentibus. *Stamina* 14 mm. longa. *Ovarium* densissime pilosum. *Legumen* (statu juniore) densissime pilosum.

Sierra Leone : S.W. Prov., Bo Dist., Bumpe, fl. and young fr. 2 Nov. 1948, *Deighton* 4926 (K, holotype ; S.L. Herb., isotype) : climber in forest at river edge ; calyx and outside of standard brown ; inside of standard pale mauve, keel deep mauve. Moyamba Dist., Njala, in bud 20 Jan. 1927, *Dalziel* 8110 (K) : shrub in forest.

Millettia warneckei *Harms* var. **porphyrocalyx** (*Dunn*) *Hepper* stat. nov.

Millettia porphyrocalyx Dunn in Journ. Bot. **49** : 220 (1911) ; Journ. Linn. Soc., Bot. **41** : 198 (1912) ; F.W.T.A. **1** : 383 (1928) ; Bak. f. Leg. Trop. Afr. **2** : 229.

French Guinea : Entre le Konkouré et Timbo, fl. March 1905, *Chevalier* 12507 (K, syntype).

This plant differs from typical *M. warneckei* only in the colour of indumentum on the calyx which is black-purple instead of yellow-brown.

Platysepalum hirsutum (*Dunn*) *Hepper* comb. nov.

Millettia hirsuta Dunn in Journ. Linn. Soc., Bot. **41** : 208 (1912) ; F.W.T.A. **1** : 382 (1928) ; Bak. f. Leg. Trop. Afr. **2** : 234.

Ivory Coast : Pont de l'Agbo, Chemin de fer, km. 82, fr. 20 Dec. 1906, *Chevalier* 16829 (K, lectotype). Région du Moyen-Comoe, Indénié, aux environs de Mbasso, fr. 24 Dec. 1909, *Chevalier* 22644 (P).

Dunn described this as a *Millettia* from fruiting specimens, but now abundant material is available from Liberia and Sierra Leone showing the typically enlarged calyx of *Platysepalum*. I have taken *Chevalier* 16829 as the lectotype since Dunn did not indicate any type specimen.

Aeschynomene neglecta *Hepper* sp. nov. [subgen. *Bakerophyton* J. Léonard] ; affinis *A. lateritiae* Harms, sed caulibus minute setosis vel glabriusculis, pedicellis longioribus, fructibus exsertis differt. (Fig. 3A).

[*A. lateritia* (non Harms)—Hutch. et Dalz., F.W.T.A. **1** : 415 (1928), pro parte, quoad *Dalziel* 599, *Lely* 570.]

Herba annua gracilis, 40–60 cm. alta, ± prostrata. *Caulis* glaber vel minute setulosus. *Stipulae* lanceolatae, acutae, 7-nervae, 5–7 mm. longae, marginibus sparse ciliatis. *Folia* subsessilia, 2–3·5 cm. longa, rhachidibus sparse ciliatis vel setulosis vel glabris. *Foliola* 7–13-juga, oblonga, glabra, 5–8 mm. longa, apice rotundata costa in cuspidem capillarem exserta. *Bracteae* 3-lobatae, lobis inaequalibus, margine setulosis ; bracteolis calyci circiter aequilongis, ad pedicellorum apicem lanceolatis acutis, margine sparse breviter setuloso-fimbriatis. *Pedicelli* tempore florendi

8–10 mm. longi, fructibus accrescentes usque 15 mm. longi, filiformes, minute setulosi. *Calyx* 2-lobatus, lobo superiore 2 mm. longo apice 2-dentato, lobo inferiore 2·2 mm. longo apice 3-dentato, glaber sed apice sparse ciliatus. *Vexillum* quadratum 2·2 mm. longum, emarginatum. *Carina* dolabriformis, apicibus liberis. *Alae* obovatae, carinae subaequales, 2 mm. longae, auriculis brevibus instructae. *Stamina* 10, connata, filamentis et antheris alterne majoribus et minoribus (more subgen. *Bakerophyton*). *Ovarium* 2-articulatum. *Fructus* calycem excedens ; legumen minute papillosum.

Northern Nigeria : Benue Prov., Abinsi, fl. and fr. 17 Feb. 1912, *Dalziel* 599 (K, holotype) : prostrate trailer. Plateau Prov., Naraguta and Jos, in wet places, fl. and fr. 13 Sept. 1921, *Lely* 570 (K) : a slender leguminous herb in masses, about 1 ft. high ; flowers orange coloured ; pinnae close in the evening. Bauchi Plateau, rocks and plains, fl. and fr. Sept. 1930, *Lely* P.691 (K) : a prostrate annual 1–2 ft. ; with small yellow pea flowers and fine pinnate leaves.

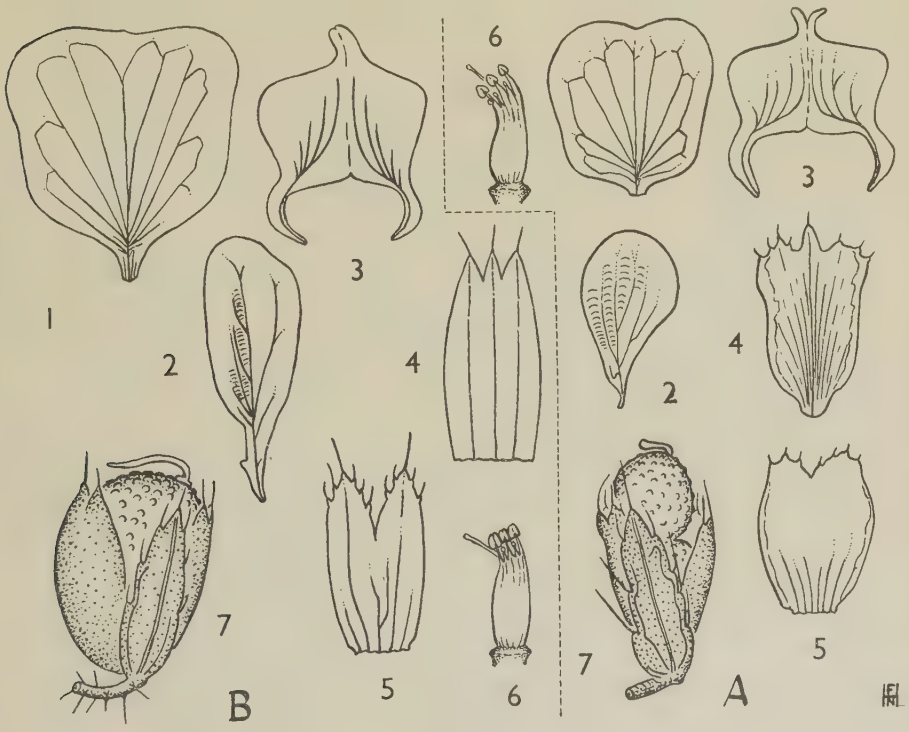

Fig. 3. A. *Aeschynomene neglecta* Hepper. Flower drawn from *Lely* 570 ; fruit *Dalziel* 599, N. Nigeria.

B. *A. lateritia* Harms. Drawn from *Hepburn* 42, N. Nigeria.

1, standard ; 2, wing ; 3, keel opened out ; 4, calyx lower lip, inside ; 5, calyx upper lip, inside ; 6, stamens ; 7, mature fruit enclosed by calyx and bracteoles ; all × 11.

This is a third species for Dr. Léonard's new subgenus *Bakerophyton* in Bull. Jard. Bot. Brux. **24** : 83 (1954), the others being *A. pulchella* Planch. ex Bak. and *A. lateritia* Harms. *A. neglecta* is distinguished from *A. lateritia* by the almost glabrous stems, longer pedicels and exserted fruits. Details of the flowers of the two species are compared in fig. 3.

Aeschynomene deightonii *Hepper* sp. nov. [subgen. *Aeschynomene*] ; affinis *A. schimperi* Hochst. ex A. Rich. sed pedicellis medio haud articulatis, caulibus pilosis, fructibus persistenter pilosis differt. (Fig. 4).

[*A. schimperi* (non Hochst. ex A. Rich.)—Hutch. et Dalz., F.W.T.A. **1** : 416 (1928), pro parte, quoad *Chevalier* 14977 ; 20170. *A. djalonensis* A. Chev., Explor. Bot. 186, nomen nudum.]

Suffrutex 1–2 m. altus, caulibus diffusis tenuibus, praecipue partibus junioribus pilosis, pilis flavis. *Radix* extra lignosa intus medullosa, haud crassa, radiculis noduliferis. *Stipulae* falcatae, basi appendiculatae, apice acutae, ciliatae, persistentes, appendice incluso 7–10 mm. longae. *Folia* pinnata, 4–5 cm. longa, rhachidibus setosis basi tumidis. *Foliola* (10-) 12–14-juga, oblonga, 6–9 mm. longa, glabra vel nonnunquam marginibus et costis parce ciliatis. *Pedicelli* erecti, pilosi, c. 2 cm. longi, 1–2 in quaque axilla, haud articulati sed basi bractea parva, apice bracteolis 2 praediti. *Calyx* 2-lobatus, lobo superiore late oblongo 6 mm. longo apice mucronato, lobo inferiore anguste oblongo 6·5 mm. longo apice sub-3-dentato, sparse setosus. *Corolla* lutea glabra. *Vexillum* late obovatum, 10 mm. longum, 8 mm. latum, apice profunde emarginatum, unguiculo brevi. *Carina* c. 9 mm. longa, margine inferiore fimbriato. *Alae* obovato-oblongae, 7 mm. longae. *Stamina* 10, monadelphia, omnia similia. *Ovarium* dense pilosum. *Fructus* (5–) 6–7-articulatus, persistenter pilosus, juventute flavus, maturitate spadiceus, marginibus vel margine uno undulatis vel utrinque rectis.

French Guinea : Dans la brousse de Kouria à Ymbo, fl. and fr. 7 Oct. 1905, *Caille* in Herb. *Chevalier* 14977 (P ; K). Entre Dalaba et Souguéta, fl. and fr. 21–24 Oct. 1907, *Chevalier* 20170 (P ; K fruits).

Sierra Leone : N. Prov., Port Loko Dist., Kafu Bullom Chiefdom, Mahera, roadside ditch in the sun, fl. and fr. 28 Nov. 1951, *Deighton* 5685 (K, holotype) : straggling weak stems up to 2 ft., viscid ; flowers yellow, paler outside. Tonkolili Dist., Yoni Chiefdom, Yonibana, fl. and fr. 12 Nov. 1914, *N. W. Thomas* 4695 (K). Same locality, *N. W. Thomas* 4749 (K). Kasewe Forest Reserve, grassfield, fl. and fr. 7 Dec. 1950, *E. L. King* 59B (K) : plant scrambling up to at least 5 ft. ; small deep yellow flowers ; branchlets reddish, with yellow hairs ; leaves sensitive. S.E. Prov., Kailahun Dist., Peje West Chiefdom, near Jokibu, in marsh, fl. 4 Nov. 1939, *Deighton* 3774 (K) : flowers turning cream ; weak stem, plant not as sturdy as *A. sensitiva* ; leaves slowly sensitive to touch.

The nearest relative of this new species is *A. schimperi* Hochst. ex A. Rich., which also occurs in Sierra Leone and several other W. African countries. *A. deightonii* may, however, be easily distinguished by the absence of small bracts from the middle of the pedicel and by the pilose stems and fruits. It is named after Mr. F. C. Deighton, who recognised the plant in Sierra Leone as additional to the species listed in the first edition of Flora of West Tropical Africa, and kindly supplied dried material and flowers in spirit.

Kotschya speciosa (*Hutch.*) *Hepper* comb. nov.

Smithia speciosa Hutch. in Kew Bull. **1921** : 365 : Hutch. et Dalz., F.W.T.A. **1** : 416 (1928) ; Bak. f. Leg. Trop. Afr. **2** : 306 (1929).

Northern Nigeria : Naraguta, *Lely* 478 (K, holotype).

Kotschya micrantha (*Harms*) *Hepper* comb. nov.

Smithia micrantha Harms in Journ. de Bot. **22** : 113 (1909) ; Chev. Explor. Bot. 187 ; Hutch. et Dalz. F.W.T.A. **1** : 416 (1928) ; Bak. f. Leg. Trop. Afr. **2** : 305 (1929).

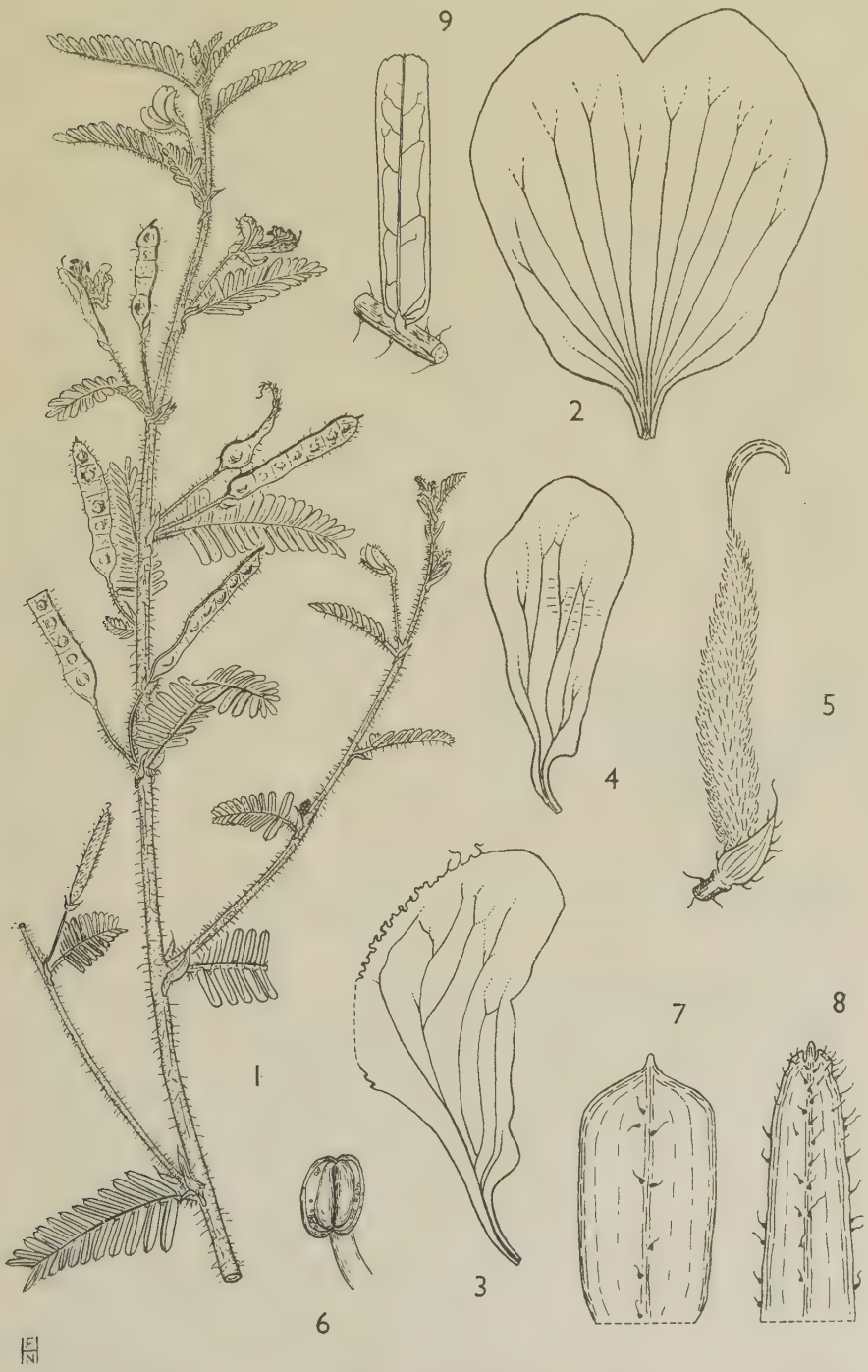

FIG. 4. *Aeschynomene deightonii* Hepper. 1, flowering branch, × ⅔ ; 2, standard petal, × 6 ; 3, keel petal, × 6 ; 4, wing petal, × 6 ; 5, pistil and bracteole, × 6 ; 6, anther (dehisced), × 10 ; 7, upper calyx lobe, × 6 ; 8, lower calyx lobe, × 6 ; 9, leaflet, × 3. Drawn from *Deighton* 5685.

French Guinea : Dans les marais sur bowal à Bouria *Caille* in Herb. *Chevalier* 14960 (K ; P, holotype).

The locality Bouria may be an error for Kouria.

Kotschya uniflora (*A. Chev.*) *Hepper* comb. nov.

Smithia uniflora A. Chev. in Bull. Mus. Hist. Nat., sér. 2, **5** : 479 (1933).

French Guinea : Kindia, *Jacques-Félix* 246 (P, holotype).

Kotschya lutea (*Portères*) *Hepper* comb. nov.

Smithia lutea Portères in Rev. Bot. Appliq. **19** : 788 (1939).

French Guinea : Mt. Nimba, 1,560 m. alt., *Portères* 3157 (in Herb. *Jacques-Félix*, holotype).

Fig. 5. *Kotschya ochreata* (Taub.) Dewit & Duvign. var. *longipetala* Hepper. 1, flower without petals. 2, wing petal ; 3, keel petal (one side) ; 4, standard ; all × 6. Drawn from *Thomas* 6872.

Kotschya ochreata (*Taub.*) *Dewit et Duvign.* var. **longipetala** *Hepper.* A typo corolla calyce 2 -2½-plo longiore, inflorescentia brevi, foliis brevibus et rhachi ciliato haud piloso differt. (Fig. 5).

Frutex ut typus sed tenuior. *Folia* rhachi ciliato ; foliola 6–8 (–10), maturitate 1–2 cm. longa. *Petala* 7–9 mm. longa, basi longe unguiculata, apice saepe longe ciliata, vexillo basin cuneato et vix auriculato, apice profunde emarginato ; alis oblongis, basin sub appendiculatis ; carina falcata, basi appendiculata.

French Guinea : Kindia, *Jacques-Félix* 245 (P). Environs de Dalaba, fl. Nov. 1935, *Jacques-Félix* 579 (K ; P). Environs de Pita, fl. Dec. 1935, *Jacques-Félix* 665 (K ; P).

Sierra Leone : N. Prov.. Port Loko Dist., Bullom, *Smythe* 106 (K) : by roadside. Port Loko Dist., Kumrabai, 50 ft. alt., fl. and fr. 23 Dec. 1914, *Thomas* 6872 (K, holotype) : vernacular name " Ak'akalind " (Temne). Same locality, 23 Dec. 1914, *Thomas* 6974 (K) : vernacular name " dogho " (Mende). Without locality *Thomas* 7095 (K).

I am grateful to Mr. H. Jacques-Félix for drawing my attention to this variety and allowing me to publish its description.

Mucuna poggei *Taub.* var. **occidentalis** *Hepper* var. nov. ; a typo foliolis subtus minute adpresso-pubescentibus calycis lobo inferiore longiore differt.

[*M. urens* (non DC.)—Hutch. et Dalz., F.W.T.A. **1** : 406 (1928), pro parte quoad *Chipp* 735, *Dent Young* 67.]

Sierra Leone : N. Prov., Koinadugu Dist., Wara Wara Yagala Chiefdom, Kabala, 1,200 ft. alt., fr. 18 Sept. 1914, *N. W. Thomas* 2218 (K) : " masonyi " (Temne), " njui " (Mende), " kuruma " (Koranko). Koinadugu Dist., Sulima Chiefdom, Falaba Rest House, fl. 28 Sept. 1951, *Small* 310 (K) : creeper over granite outcrop. Koinadugu Dist., Dembelia-Musaia Chiefdom, Musaia, abundant around Kabala and Musaia area, fl. and fr. Aug.–Sept. 1951, *J. Wells* in Herb. *Deighton* 5580 (K) ; 5600 (K, holotype) : very irritating hairs on the inflorescence and particularly on the fruit ; flowers cream coloured, slightly tinged green in parts, often with irregular blue-black markings (probably where damaged) ; calyx similar colour to corolla but more deeply tinged green. Tonkolili Dist., Dansogoia Chiefdom, Bumbuna, 650 ft. alt., fl. 14 Oct. 1914, *N. W. Thomas* 3317 (K) : " masonyi " (Temne), " keyui " (Mende).

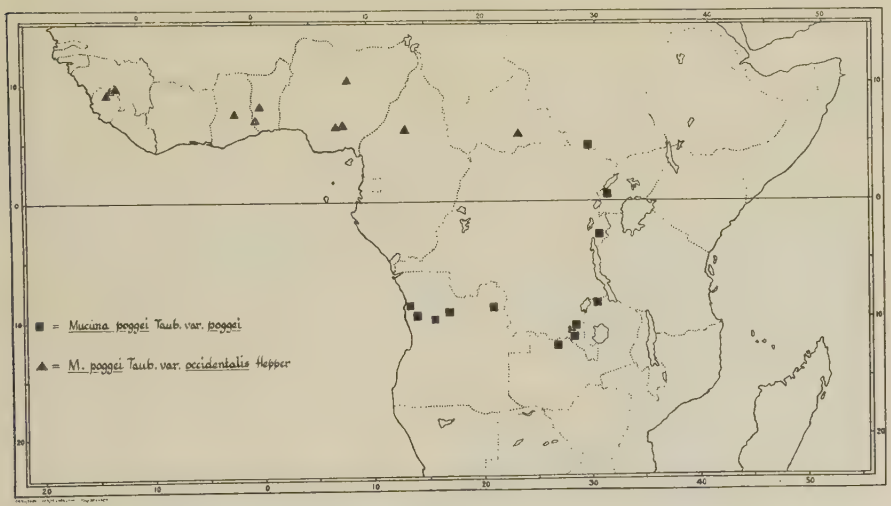

Fig. 6. Distribution of *Mucuna poggei* Taub. var. *poggei* and *M. poggei* Taub. var. *occidentalis* Hepper.

Gold Coast : Ashanti, Ejura, common creeper over small trees in savannah forest, fl. 22 Aug. 1921, *Chipp* 735 (K) : flowers whitish-green ; calyx rusty-tomentose, causes intense itching.

British Togoland : Togo Mts., Misahöhe Pass, 1,500 ft. alt., climber growing over shrubs or trees or sprawling, fl. 7 Oct. 1935, *D. Gillett* 66 (K) : climber 30–40 ft. high, bearing flowers in immense hanging clusters 7 in. broad by 1 ft. or more in length ; sepals reddish-brown covered with minute hairs which cause a violent itch ; petals white ; stamens 1 + 9 joined, 4 of which are larger ; leaves trifoliolate, fine hairs on the under-surface, prominent leaf-base ; stems warty and fibrous and it is said they are used for the preparation of a black native dye.

Northern Nigeria : Plateau Prov., Vom, 3,000–4,500 ft. alt., *Dent Young* 67 (K) : climber 10–15 ft., flowers green, 30 or more in a cluster.

Eastern Nigeria : Onitsha Prov., Udi Dist., Enugu Extension Forest Reserve, steep sandy bank of Ekulu River, fl. 24 Sept. 1953, *Onochie* FHI 34102 (K) : climbing shrub with long pendulous inflorescences about 1 ft. long, axis cream ; calyx cream with brown stiff hairs ; corolla white ; filaments cream, anthers grey. Ogoja Prov., Ogoja Dist., very common on farm lands, *Rosevear* 71/29 (K).

French Cameroons : without locality *Mildbraed* 10076 (K).

Ubangi-Shari : Yalinga *Le Testu* 3165 (K).

Distinguishable from var. **poggei** by the leaves being minutely appressed-pubescent beneath, instead of sericeous, and the lowest lobe

of the calyx usually being longer and narrower. The distribution is markedly western in tropical Africa.

Taubert in his original description of *M. poggei*, in Engl. Bot. Jahrb. **23** : 194 (1896), did not designate a type specimen. He cited *Welwitsch* 2240–2241, *L. Marques* 279, *Pogge* 831 and *Büttner* 4 ; of these the last two were apparently destroyed at Berlin. I therefore take *Welwitsch* 2241 (BM) as iso-lectotype which is one of the specimens whose duplicates were distributed under the compound number 2240–2241. The specimen comes from Angola and Taubert describes the leaflets as " subtus incano-sericeis ", which is certainly true of the Welwitsch specimen. Comparison of this with part of the type of *M. rubro-aurantiaca* De Wild. (*Homblé* 664) has shown no characteristic difference, although the indumentum of the latter is somewhat denser, so I consider *M. rubro-aurantiaca* De Wild. (1913) should be treated as a synonym of *M. poggei* Taub. (1896).

The map in fig. 6 shows the distribution of var. *poggei* and var. *occidentalis* as indicated by specimens at Kew and from further information kindly provided by Prof. Hauman. One collection from Bwamba, Toro Dist., Uganda (*Liebenberg* 902, K) has leaves with the hairs beneath intermediate in length between the two varieties, but the calyx is more typical of var. *occidentalis*. Another specimen from Igale, Tukuyu Dist., Tanganyika Territory (*St. Clair Thompson* 1041, K) is pilose on the nerves beneath but glabrous between them ; the calyx has the shorter lower lobe of var. *poggei*. Taubert in his description of *M. poggei* cites *Büttner* 4 from Bismarkburg, Togoland. I have not seen this specimen but I assume on the grounds of its distribution that it is var. *occidentalis* if it is still extant.

Vigna mungo (*Linn.*) *Hepper* comb. nov.

Phaseolus mungo Linn., Mant. **1** : 101 (1767).

This possesses large medifixed stipules and narrow septate pods, both of which are characters of *Vigna* under the new concept of the genus adopted by Dr. Wilczek.

Vigna filicaulis *Hepper* sp. nov. ; affinis *V. venulosae* Bak. sed foliis supra (vel saltem costa supra) pubescentibuss ubtus adpresso-pilosis, foliolis terminalibus subsessilibus, apice obtuso calyce pubescente dentibus acutis differt.

[*V. venulosa* Bak. var. *pubescens* A. Chev. (non *V. pubescens* Wilczek 1954) —Bull. Bot. Soc. Fr., Mém. 8 : 163 (1912) ; Chev., Explor. Bot. 202. *V. venulosa* var. *venulosa* of Chev., Explor. Bot. 202, pro parte quoad *Chev.* 22259.]

Herba perennis, volubilis. *Caulis* filiformis, pubescens. *Folia* 3-foliolata ; foliola terminalia subsessilia, foliola omnia oblonga vel ovato-oblonga, (2–) 3–5 cm. longa, 6–9 mm. lata, utrinque (praecipue subtus) pubescentia, pilis albis adpressis, marginibus ciliatis, basi et apice obtusa. *Stipulae* triangulares, cordatae, 2·5 mm. longae, pubescentes. *Corolla* lutea ; vexillum suborbiculatum, apice integrum, callo intus basin versus nullo, 10 mm. longum, 11 mm. latum. *Legumen* nigrum vel fuscum, c. 2 cm. longum, 4 mm. latum ; semina 2–3, brunnea, 6 mm. longa, 3 mm. lata, arillo tertiam partem seminis superiorem amplectente.

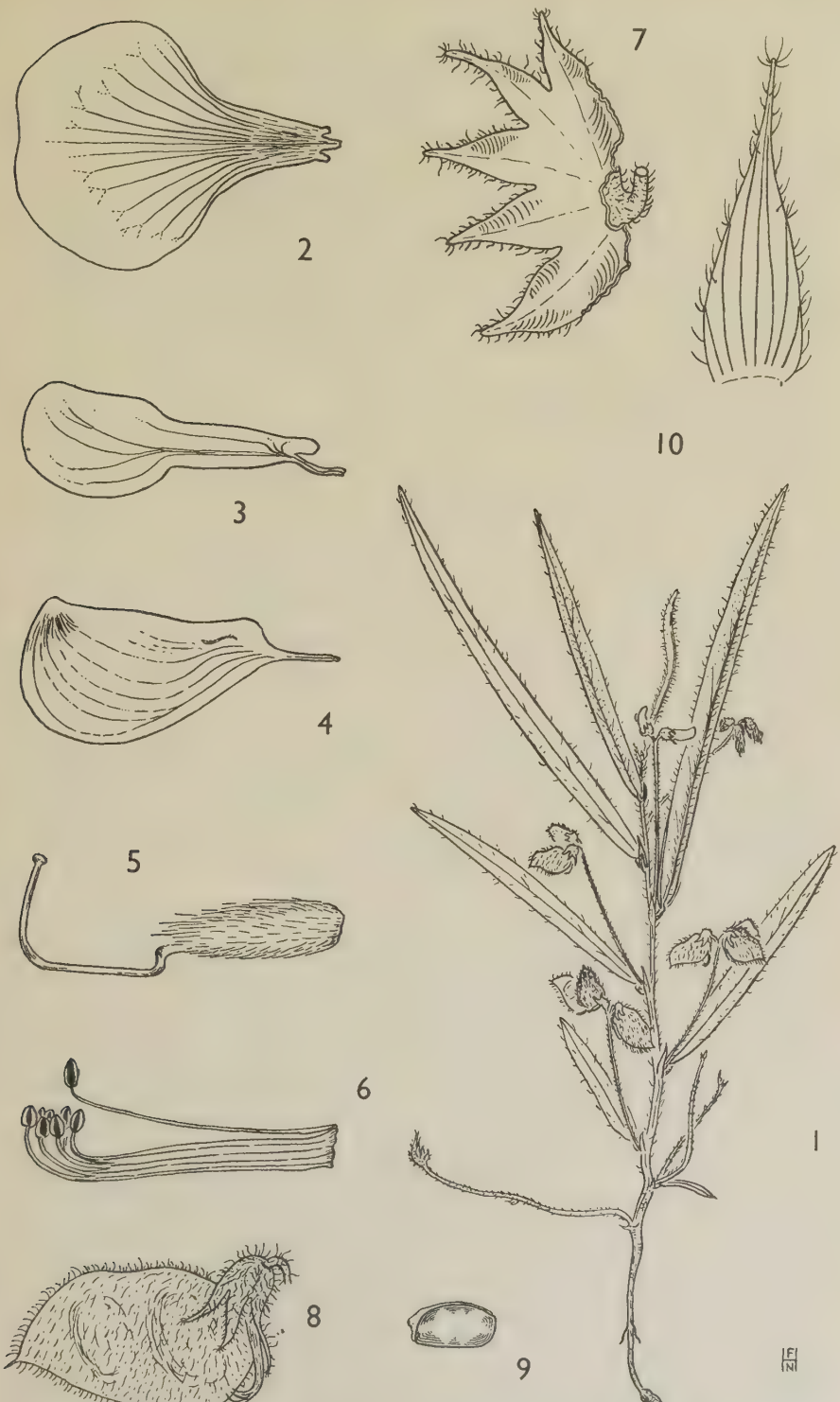

FIG. 7. *Eriosema tenue* Hepper. 1, habit, × $\frac{1}{3}$; 2, standard, × 8; 3, wing, × 8; 4, keel, × 8; 5, pistil, × 8; 6, stamens, × 8; 7, calyx, × 8; 8, fruit (immature), × 4; 9, seed, × 4; 10, stipule, × 8. Drawn from *Keay* FHI 25868.

Ivory Coast : Cercle du Baoulé-Nord, vallée du Nzi moyen, dans le poste de Mbayakio, fl. and fr. 3 Aug. 1909 *Chevalier* 22259. Dans le district de Kodiokoffi, entre Kodiokoffi et le campement de Krondroko, 12 Aug. 1909, *Chevalier* 22359 (P) : marais.

Gold Coast : Ashanti, 5 miles N. of Ejura, in damp savannah grassland, fl. and fr. 9 Dec. 1953, *Morton* GC 9508 (K, holotype fruit ; GC) : flowers yellow. 3 miles N. of Ejura, climber in damp grassland, fl. 9 Dec. 1953, *Morton* GC 9714 (K, holotype ; GC, isotype) : flowers yellow.

The Ivory Coast specimens are markedly appressed-pilose on both sides of the leaflets, but the Gold Coast plants are sparsely so above and hairs appear to persist only on the midribs above of older leaves. The Ivory Coast plants also have rather smaller flowers, the standard being 6 mm. long and 8 mm. broad with 4 very slight ridges inside the base. The fruit and seeds were described from *Morton* GC 9508.

Eriosema tenue *Hepper* sp. nov. ; affine *C. shirensi* Bak. f. sed foliis semper 1-foliolatis, corolla et calycibus brevioribus, racemis 2–4-floris differt. (Fig. 7).

[*E. shirense* (non Bak. f.)—Hutch. et Dalz., F.W.T.A. **1** : 403 (1928), pro parte quoad *Chevalier* 13261.]

Herba tenuis ; caulis 9–12 cm. longus, villosus ; ramulis basalibus 1 vel 2. *Folia* 1-foliolata, sessilia vel subsessilia ; petioluli 1–2 mm. longi ; lamina linearis, 6–10 cm. longa, c. 5 mm. lata, basi cuneata, apice acuta, margine et costa pilosa, subtus glanduloso-punctata, supra reticulata sparse pilosa. *Stipulae* subulato-lanceolatae, 5–7 mm. longae, pilosae. *Racemi* omnes axillares, 2–3 cm. longi, flores 2–4, subsessiles, sub apicem congesti. *Bracteolae* lineares, 2 mm. longae, infra calycem sitae. *Calyx* 4 mm. longus, pilosus, glanduloso-punctatus, 5-dentatus, dentibus subulatis 1–2 mm. longis. *Corolla* lutea, rubro-tincta ; vexillum obovatum, 5 mm. longum, 4 mm. latum, supra sparse pilosum, unguiculo brevissimo ; alae obovato-oblongae, 5 mm. longae, unguiculo 1 mm. longo ; carina alis aequilonga. *Stamina* diadelphia 9 + 1. *Legumen* dense pilosum, 1 cm. longum 5 mm. latum ; semina 2.

French Guinea : Entre Kaba et Mamou, May 1905, *Chevalier* 13261 (K).

Northern Nigeria : Bauchi Plateau, Vom, 3,000–4,000 ft. alt. 1922, *Dent Young* 70 (K) : flowers orange. Zaria Prov., Bernin Gwari Dist., Angwan Kibiya, about 3 miles N.E. of Mando, fl. and fr. 17 June 1950 *Keay* FHI 25868 (K, holotype) : in *Terminalia laxiflora* open scrub-savannah ; herb ; flowers yellow tinged red.

E. tenue var. **rufum** *Hepper* var. nov. ; a typo differt caulibus rufo-pilosis, stipulis longioribus, c. 1·3 cm. longis, foliis latioribus 5–13 mm. longis. Radix tuberosus.

Tanganyika Territory : Manyoni Dist., Chaya, 1250 m. alt., *Peter* 33973 (K, holotype) : einfach lineale Blätter ; gelb ; aus Knolle. Tanga area, Yilikori to Maramba, 125 m. alt., *Peter* K.1135 A [O IV 344] (K) : kleine Pflanze aus Knolle ; Blätter einfach ; blass gelb.

E. tenue is characterised by the very few-flowered racemes with only 2–4 flowers at the end of the peduncle, which separates it from unifoliolate *E. praecox* R. E. Fries and *E. prunelloides* Welw. ex Bak. f. *E. humile* Hauman from the Belgian Congo has longer petioles.

Eriosema parviflorum *E. Mey.* ssp. **collinum** *Hepper* ssp. nov. ; foliis et caulibus ssp. *parvifloro* similibus (saltem in Africa occidentali) sed floribus longioribus differt. Habitat in collibus.

Herba 13–30 (–45) cm. alta. *Flores* 12–15 mm. longi ; petala omnia ± aequalia. *Inflorescentia* pauciflora, 6–11 usque 15 flores gerens.

[*Eriosema djalonensis* A. Chev., Explor. Bot. 208 (1920), nomen nudum, pro parte, quoad *Chevalier* 21013 et 21071.]

French Guinea : Pays des Guerzés, montagne de Nzo, 800 m. alt., dans la savane, 26 Mar. 1909 *Chevalier* 21013 (P) : fleurs jaunes. Pays des Guerzés, entre Kaoulendougou, près Nzo, 28–29 Mar. 1909 *Chevalier* 21071 (K).

Sierra Leone : N. Prov., Koinadugu Dist., Bintimani Peak, 1800 m. alt., 2 May 1949, *Capstick* in Herb. *Deighton* 5608 (K, holotype).

This is a large-flowered plant which, on account of its montane distribution, would appear to justify the rank of subspecies. All the flowers of *E. parviflorum* which I have measured are 6–9 mm. long, whereas ssp. *collinum* has flowers 12–15 mm. long.

Dalbergia albiflora *A. Chev. ex Hutch. et Dalz.* ssp. **echinocarpa** *Hepper* ssp. nov. [Sect. *Dalbergia*], a typo sed fructibus echinatis, stipulis reflexis longioribus differt. (Fig. 8, B).

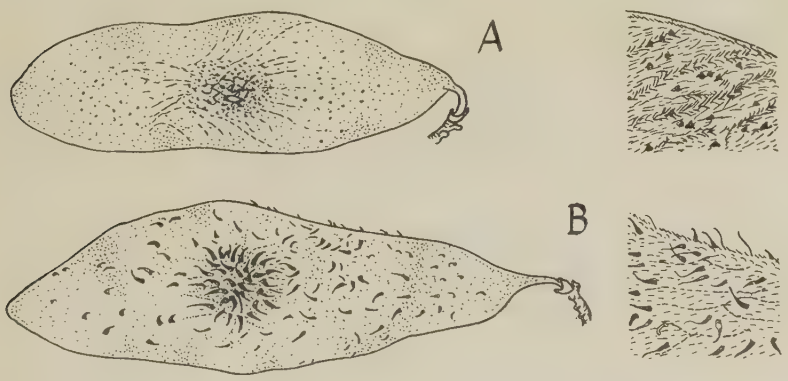

Fig. 8. *Dalbergia albiflora* A. Chev. ex Hutch. & Dalz.
A. ssp. *albiflora* × 1 ; detail of surface, × 2. Drawn from *Deighton* 3601.
B. ssp. *echinocarpa* Hepper × 1 ; detail of surface, × 2. Drawn from *Jones* FHI 18863.

Frutex scandens ad 5 m. vel ultra altus. *Stipulae* lanceolatae reflexae, 9 mm. longae, caducae. *Fructus* ellipticus basi cuneatus, apice subacutus, adpresso-pubescens, medio valde echinatus, cum setis c. 3 mm. longis, falcatis, nigris, basi crassis, apice tenuis, pallidis, 6–7 cm. longis, (18–) 22–30 mm. latis ornatus ; semen 1 prominens.

Eastern Nigeria : Onitsha Prov., Udi Dist., Enugu, slopes of Milliken Hill, on the damp edges of the sandstone cliff face, buds and fr. May, *A. P. D. Jones* FHI 18863 (K, holotype ; FHO ; FHI) : scrambling shrub with stems to 15 ft. long. Enugu Forest Reserve Extension, in fringing forest on the Ekulu River, alt. 600 ft., fl. 1 July 1928, *Conservator of Forests* 335 (FHO) ; 336 (FHO). Same locality, steep sandy bank of the Ekulu River, fr. 24 Sept. 1953, *Onochie* FHI 34100 (K) : shrub or small tree with rather straggling habit, about 10 ft. high ; fruits brown ; young leaves with brown pubescence.

D. albiflora was described from flowering material (*Chev.* 19175 P ; K) from the Ivory Coast and has remained a somewhat obscure species. However, ample material has now accumulated at Kew from Sierra Leone and there is also at Paris a specimen (*Chev.* 20220) from Fouta Djalon, French Guinea, in fruit. The pods of the French Guinea and Sierra Leone material are similar. They are oblong, cuneate and

shortly stipitate at the base, rounded or obtuse at the apex, 4·5–9 cm. long, 1·7–2·3 cm. broad, evenly papilose with very small blackish-brown or yellow protuberances and covered with a yellow-brown pubescence ; usually 1-seeded, but occasionally 2-seeded, prominent and reticulate above the seed and becoming rather woody when mature. (Fig. 8, A). Fruiting material from Ivory Coast has not yet been seen but it is likely to be similar to that from Sierra Leone, a distance of about 700 km., and this has been taken as ssp. *albiflora*. The Nigerian material now described as ssp. *echinocarpa* was collected about 1,500 km. from the type locality in Ivory Coast.

D. albiflora is closely related to *D. glandulosa* Dunkley (1935), non Benth. (1860), from N. & S. Rhodesia. The occurrence of ssp. *echinocarpa* in S.E. Nigeria would appear to be the first distributional link between these species.

Dalbergia crispa *Hepper* sp. nov. [Sect. *Ecastaphyllum*] ; affinis *D. heudelotii* Stapf foliolis subtus crispule pilosis vel subglabris, fructu minore complanato contorto-plicato ad semina valde umbonato et fulvo-tomentoso differt. (Fig. 9 A).

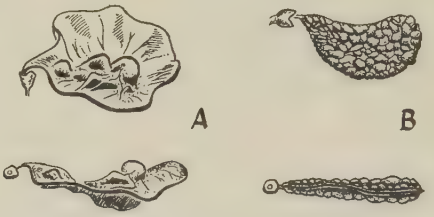

Fig. 9. A. *Dalbergia crispa* Hepper, fruit, × 1. Drawn from *Deighton* 1822.
B. *D. rugosa* Hepper, fruit, × 1. Drawn from *MacDonald* 479.
These fruits may not be fully mature.

Frutex scandens. *Rami* teretes, juventute tomentosi, maturitate subglabri luteo-lenticellati. *Stipulae* oblongo-lanceolatae, subfalcatae, 7–10 mm. longae, 2–3 mm. latae, extra tomentosae, intus glabrae, caducae. *Folia* pinnata, rhachide breviter ferrugineo-pubescente, cum petiole 4–6 (–8) cm. longa. *Foliola* 5–7 alternata vel subopposita, ovata vel ovato-elliptica, basi rotundata vel subcordata, apice breviter acuminata subacuta, juventute utrinque tomentosa, maturitate subtus sparsissime pilis crispis obsita vel subglabra et levia, superne glabra, reticulata. *Inflorescentiae* multiflorae, cymoso-paniculatae, axillares, fasciculatae, 1·5–2·7 cm. longae, dense ferrugineo-pubescentes. *Bracteae* ovatae caducae 1 mm. longae ; bracteolae ad basin calycis duo, minutae. *Pedicelli* 2 mm. longi. *Calyx* striatus, extra puberulus, 2·5 mm. longus, breviter dentatus. *Corolla* alba, in sicco rubra, glabra. *Vexillum* ± quadratum, basi subcordatum, apice late emarginatum, in tota 7 mm. longum, unguiculo tenue 3 mm. longo incluso. *Alae* oblongae, 7 mm. longae. *Carina* 6 mm. longa. *Stamina* diadelpha, 5 + 5. *Ovarium* stipitatum tomentosum praecipue ad suturas. *Legumen* breviter stipitatum (c. 3 mm. longum), complanatum, ellipticum, basi cuneatum, 2–2·5 cm. longum, 1 1·3 cm. latum, contorto-plicatum, reticulato-verrucosum, ad semina valde umbonatum, fulvo-tomentosum. *Semina* 1 (–2).

Sierra Leone : S.W. Prov., Moyamba Dist., near Njala, at the edge of stream, fl. 23 May 1929, *Deighton* 1733 (K) : climber ; flowers white. Same locality, fl. and fr. 25 Mar. 1930, *Deighton* 1822 (K, holotype) : liane ; flowers white, very floriferous. Bonthe Dist., Gbap, in swamp covered with high bush, fl. 16 Mar. 1946, *Adames* 20 (K) : scrambling on trees ; frequent. N. Prov., Bombali Dist., Batkanu, fl. 14 Apr. 1915, *N. W. Thomas* 18 (K) : vernacular names : " bagi " (Susu), " labo " (Temne), " Akai " (Mende). Without locality, 1915, *N. W. Thomas* 10088 (K) ; 10101 (K) ; 10103 (K) ; 10468 (K) ; 10589 (K) ; 10604 (K).

Dalbergia rugosa *Hepper* sp. nov. [Sect. *Ecastaphyllum*] ; affinis *D. heudelotii* Stapf sed foliolis subtus persistenter tomentosis, fructu minore extra ruminato differt. (Fig. 9 B).

[*D. heudelotii* (non Stapf)—Hutch. et Dalz., F.W.T.A. **1** : 375 (1928) pro parte, quoad *Aylmer* 64, *MacDonald* 479.]

Frutex scandens. *Rami* teretes, juventute dense tomentosi, maturitate subglabri, sparse lenticellati. *Stipulae* ovatae, 5 mm. longae, 3 mm. latae, extra tomentosae, intus glabrae, caducae. *Folia* pinnata, rhachide dense tomentosa cum petiolo 3·5 -5 cm. longa. *Foliola* 5–7 alternata vel subopposita, ovata vel ovato-elliptica, maturitate subtus tomentosa, minute rugosa, superne glabrescentia, reticulata, 4–10 cm. longa, 3–5 cm. lata ; costa superne impressa ± tomentosa ; nervi utrinque 10–13 ; foliolum terminale, aliis paulo majus basi obtusum-cuneatum, haud ut lateralia obtusum-obcordatum. *Inflorescentiae* cymo-paniculatae axillares fasciculatae, dense tomentosae, 1–3 cm. longae. *Bracteae* ovatae subpersistentes, 1·5 mm. longae ; bracteolae ad basin calycis duo ovatae. *Pedicelli* 2 mm. longi. *Calyx* extra puberulus, 3 mm. longus, breviter dentatus. *Corolla* primo alba tandem lutea (in sicco rubra), glabra. *Vexillum* suborbiculare, basi obtusum, apice emarginatum, in tota 7 mm. longum, unguiculo tenue 3 mm. longo incluso. *Alae* obovato-oblongae, 7 mm. longae. *Carina* 5 mm. longa. *Stamina* diadelphia, 5 + 5. *Ovarium* stipitatum omnino tomentosum. *Legumen* semi-lunare 1·5 -2 cm. longum, 9 mm. latum, extra conspicue rugoso-ruminatum et tomentosum, endocarpio medulloso spongioso. *Semina* 1 (–2).

Sierra Leone : S.E. Prov., Kenema Dist., Kenema, *E. Macdonald* 479 (K, holotype). Pujehun Dist., Pujehun, flowers 28 Apr. 1914, *G. Aylmer* 64 (K) : climbing shrub ; flowers white. N. Prov., Tonkolili Dist., Matotaka, 400 ft. alt., fr. 29 July 1914, *N. W. Thomas* 1284 (K) : vernacular names : " sakai " (Susu), " elapumerokaut " (Temne), " boie " (Mende).

Liberia : Grand Cape Mount County, Mecca, fl. 24 Dec. 1947, *Baldwin* 10838 (K) : flowers white then yellow.

These two species are quite distinct from one another on fruit characters and by their indumentum. These characters also serve to distinguish them from other species, notably *D. heudelotii* Stapf with which they have both been confused at Kew. A sterile or non-fruiting specimen of *D. crispa* is best separated from *D. ruminata* by examining the undersurface of the leaflets. Young leaves of the former will be seen to have rather long crisped indumentum, whilst those of the latter have a shorter and denser tomentum. The older leaflets of *D. crispa* become almost glabrous and smooth except on the nerves, whilst those of *D. ruminata* remain more or less tomentose and are rather rough with old hair-bases.

Leptoderris trifoliolata *Hepper* sp. nov. ; species incertae sedis ; ab omnibus speciebus descriptis foliolis ternatis, stipellis brevibus, petalis crassis, fructibus parvis oblongis pilis fulvo-serceis dense obtectis, facile distinguenda.

Frutex scandens ; caulis lignosus, glaber, ± squamosus. *Folia* 3-foliolata. *Rhachis* folii cum petiolo 4–8 cm. longa, teres vel lateraliter compressa juventute, dense fulvo-pilosa, postea glabrescens. *Stipellae* minutae. *Petioluli* 6–7 mm. longi, 1·5 mm. crassi, pilosi. *Stipulae* ovatae, 1–2 mm. longae. *Foliola* elliptica vel obovato-elliptica, 9–11 cm. longa, 6–7 cm. lata, basi rotundata vel subcordata, apice subacuta vel rotundata, supra fulvo-lanuginosa postea glabrescentia, subtus molliter tomentosa ; nervi primarii 5–7-jugi. *Inflorescentia* racemosa, pauciflora ; rhachis 10–20 cm. longa, argenteo-tomentosa, teres. *Bracteae* ovatae, 2 mm. longae, 1 mm. latae. *Bracteolae* lanceolatae, 1–2 mm. longae. *Flores* fasciculati sessiles, nodis floriferis 2–3 mm. longis, inter eos c. 15 mm. distantibus. *Calyx* 3–4 mm. longus, breviter 4-dentatus, dens supremus emarginatus, argenteo-tomentosus. *Corolla* crassa, lactea ; vexillum oblongum, reflexum, marginibus incurvis, 9 mm. longum ; alae oblongae, 8 mm. longae, 1·5 mm. latae ; carina obovato-oblonga, 8–9 mm. longa, supra basin usque ad apicem cohaerens. *Legumen* 1–3-seminatum, oblongum, subfalcatum, 4–6 cm. longum, 1·5–1·8 cm. latum, pilis fulvo-sericeis dense obtectis, basi ± cuneatum, apice ± rotundatum margine superiore alis inclusis brevissime 1 mm. lata.

Sierra Leone : S.W. Prov., Moyamba Dist., Njala, in bush by side of stream in low-lying grassland flooded from the river during the rainy season, fl. 24 Nov. 1948, *Deighton* 4957 (K, holotype) : flowers cream coloured, lateral petals pale mauve. The same plant in fruit, 25 Jan. 1950, *Deighton* 5296 (K, holotype of fruits).

This is undoubtedly a *Leptoderris* having the typical fasciculate inflorescences and fruits with a narrow wing on one side, but its affinities within the genus are uncertain. The thick petals, oblong standard and widely spaced lateral nerves of the leaflets places it nearest to *L. brachyptera* (Benth.) Dunn. The 3-foliolate leaves, however, are very characteristic and do not appear to occur in any other species so far described.

Shrubs for Amateurs.—*The third edition of W. J. Bean's book " Shrubs for amateurs ", revised by Mr. S. A. Pearce, has now been published. Since the appearance of the second edition twenty years ago many changes have taken place in the horticultural world, making a further revision of this standard work almost a necessity.

Mr. Pearce has included a number of species which, although not new to cultivation, have become more popular in recent years. The illustrations have also been increased by the inclusion of a number of photographs of shrubs of more recent introduction, making this a very useful work for amateur gardeners interested in the subject.

H. S. Marshall.

* Shrubs for amateurs. By W. J. Bean. 3rd edition, revised by S. A. Pearce. Pp. 127. Illus. London, 1955 (Country Life, Ltd.). Price 15s.

FISHING ROD BOTANY ; A REVIEW.

N. W. Simmonds
(Imperial College of Tropical Agriculture, Trinidad, B.W.I.).

1. Bamboos

1. *Arundinaria amabilis* McClure var. *sativa* McClure.

This, the Tonkin Cane or Tea Stick Bamboo of commerce, is known only in cultivation from a tiny area of South China on the borders of Kwangtung and Kwangsi provinces (McClure, 1931). It is the material *par excellence* of built-cane fly-casting and spinning rods which are constructed as follows.

The canes are first baked to harden them (though they must not be scorched), straightened by local heating and bending and strips are riven out with a blunt knife. The nodal prominences must be removed (by rasp or glasspaper rather than by plane) but otherwise the skin, in which much of the strength of the cane lies, is left as nearly intact as possible. The strips are then planed to an accurate equilateral-triangular section in one of a variety of possible jigs which ensures both the correct shape of the section and the correct taper. Sets of six strips are then glued together into the appropriate hexagonal rod sections, the skin of each being placed to the outside. The wall of the bamboo is thin so there is a limit to the thickness of rod which can be constructed by this means ; sections thicker than about 1 cm. are made by double-building, that is by covering a hexagonal built core with six strips of trapezial section, the skin once again being placed on the outside.

The larger diameters of stick (about 5 cm.) are preferred by rod makers for their thicker walls and for the slighter curvature of the skin. The smaller diameters are sometimes used for the butts of whole-cane rods and supply some of the better quality garden bamboos. Some material is imported to the U.S.A. as split strips according to Sineath *et al.* (1953, p. 71).

The Tonkin Cane supplanted other bamboos (see below) as the material of split-cane rods. Thus Messrs. Hardy of Alnwick inform me that they began to use it in 1912 ; the first known importation to the U.S.A. was just before 1895 (Messrs. Demarest of New York, *in litt.*) and it was apparently in use in that country for making split-cane in the early years of this century. Its universal adoption by the trade is doubtless due in part to the fact that a large bulk of a uniform and well prepared product is available on the market (cf. Trotter, 1941, p. 215). I have little doubt that other species would, if as well prepared as the Chinese product, make satisfactory rods. For example, a plant that I take to be a species of *Arundinaria* grows abundantly on eroded hillsides on the Burma side of Manipur ; in the field it seemed to have just those qualities of non-prominent nodes and extreme hardness of skin that the rod-maker needs. Probably there are several such species in the monsoon areas of India and Indo-China ; the Himalayan species *Arundinaria falcata* Nees (vern. Ringal) and *A. intermedia* Munro mentioned by Watt (1908, p. 98) may well be two of them. McClure (1953, p. 32) gives a useful list of species with notes on distribution and vernacular names.

Attempts are being made to cultivate the Tonkin Cane in Puerto Rico where there is already a small fishing rod industry (see White, 1948 and remarks below under *Bambusa tulda*).

2. *Bambusa tulda* Roxb.

This species is the one commonly cultivated in the rice areas of north-eastern India, Assam and Burma (Watt, 1908, p. 98). It has long been imported to Europe and the U.S.A. under the names Calcutta Cane, East India Brown Bamboo or variants of them (but see 3., below). The canes are baked in hot sand before export, partly to toughen them, partly to kill boring beetles, and the consequent scorching is responsible for the predominantly brown colour of the commercial article. It was the main source of split-cane rods before Tonkin Cane was adopted (see above and also under *Dendrocalamus strictus*, below) but has now been virtually entirely superseded. It supports a small industry in Puerto Rico however even now ((Mayaguez), 1940, p. 36, 1941, p. 12, 1946, p. 34; and White, 1948, p. 34) and is sometimes used for whole-cane surf rods. *Bambusa nutans* Wall. is a closely allied species from the same area which may well have entered into the composition of commercial Calcutta Cane (for botanical distinction between the two, see Rao, 1934).

3. *Dendrocalamus strictus* (Roxb.) Nees.

This is the Male* or Lance Bamboo abundant in India except in the northeast. It has nearly solid stems and was favoured for cavalry lances, whence the vernacular name. Some was (and perhaps still is) exported with the preceding species as Calcutta or East India Cane and this has given rise to much confusion in the literature. Correspondence in the Indian Forester (Bailey, 1887–89) makes it clear that Calcutta Cane was of mixed botanical origins and that one firm at least (Messrs. Hardy of Alnwick) rejected *Dendrocalamus strictus* for split-cane rods. Messrs. Hardy (*in litt.*) have explicitly confirmed this statement. Against this we have the statements of Watt (1908, p. 98 seq.) and Young (1946, p. 356) that it was the source of split-cane, both authors, by implication, excluding *Bambusa tulda* from this category. I believe this to be an error, founded perhaps on identification of atypical samples of Calcutta Cane. Probably, then, *Dendrocalamus strictus* was occasionally used to make split-cane but much less commonly than was *Bambusa tulda* to which, by reason of its softer wood, it is inferior.

4. *Arundinaria japonica* Sieb. & Zucc. (*Bambusa metake* Sieb., *Pseudosasa japonica* Makino).

This is apparently the Japanese Female Tonkin of commerce. It has fairly prominent nodes and is used for whole-cane butt and middle joints of cheap rods. A specimen from Messrs. Walker (in Kew Mus.) agrees well with the figure in Shirosawa (1911) who gives the vernacular name Yadake for this species and Medake for the nearly allied *A. simoni*

* "Male" and "female" are used of bamboos in two entirely different manners: in English the former refers to species with solid or nearly solid stems (in effect, *Dendrocalamus strictus* alone), the latter to species with hollow stems; in Japanese, according to Satow (1899, p. 19) "male" refers to species with prominent nodes, "female" to species with non-prominent ones (cf. 4 and 5, below).

A. & C. Riv. Tsuboi (1916) offers Yadake for *A. japonica* (as *Sasa japonica* Makino) and notes that the nearly allied *A. communis* Makino (vern. Yamakawatake) was then used locally for fishing rods and was much in demand for export. Freeman-Mitford (1896, p. 69) refers the names Metake and Medake to *A. japonica* and notes that they mean " female bamboo ". The following synonymy drawn from the review by Young (1945, p. 190) illustrates the dangers of using English forms of Japanese names for botanical purposes :—

Botanical	*Vernacular*
Pseudosasa japonica (Steud.) Makino, (*Bambusa* (*Arundinaria*) *metake*, *Sasa japonica* etc.) ...	Yadake or Metake
Arundinaria simoni A. & C. Riv.	Medake
Phyllostachys bambusoides Sieb. & Zucc. ...	Madake

Satow (1899) refers the last name, Madake, to *Phyllostachys quilioi* A. & C. Riv. (as *Ph. quilioi* F.M.).

All this suggests the origin of the trade name given above but also suggests that either the taxonomy is confused or that more than one species contributes to the commercial article.

5. *Phyllostachys mitis* A. & C. Riv. and *Ph. aurea* Carr. ex A. & C. Riv.

These species are apparently the source of the canes known in the trade as Brazilian Tapering Cane, Japanese Tapering Cane, Brazilian Bamboo, etc. They are used for long whole-cane surf rods and for the lower pieces of roach poles and cheap jointed rods. They have prominent asymmetric nodes and very large bud-grooves and are therefore quite unsuitable for splitting. There are several specimens in the Kew Museum from Messrs. A. E. Davis and the name *Ph. mitis* comes from one of these ; the name *Ph. aurea* comes from Sineath *et al.* (1953, p. 63) who state that it forms a very large proportion of the total bamboo imports to the U.S.A. The same authors state that, in the southeastern U.S.A., it is preferred to all others as a general purpose bamboo for cultivation on the farms.

Once again, the literature suggests that the taxonomy may be confused and/or that other species may contribute to the commercial article. Thus Shirosawa (1911) mentions *Phyllostachys aurea* Carr. ex A. & C. Riv. (vern. Hoteichiku) and *Ph. mitis* var. *heterocycla* Makino (vern. Kikkochiku) as sources of fishing rods in Japan. Tsuboi (1916) mentions *Ph. bambusoides* Sieb. & Zucc. (vern. Madake—see 4, above) as the most important economic species of bamboo in Japan but does not mention fishing rods as a use ; he further states that *Ph. nigra* Munro var. *henonis* (Mitf.) Stapf (vern. Kabukurochiku), the form *basinigra*, is favoured for this purpose. Several species regarded as promising sources of fishing rods are mentioned by Young (1946, pp. 42–6) and in an unpublished report of the U.S. Department of Agriculture (U.S.D.A., 1947). They are : *Ph. bambusoides* A. & C. Riv. (the var. " slender crookstem " from Kwangtung, China) ; *Ph. bambusoides* var. *castilloni* (Marl.) Howz. de Lehaie (from Japan) ; *Ph. flexuosa* A. & C. Riv. (from China) ; *Ph. meyeri* McClure (from China) ; and *Ph. nidularia* Munro.

2. Other Grasses

1. *Arundo donax* L.

This is the Spanish Reed of commerce. It is favoured for the lower parts of rods for bottom fishing in which great length, lightness and stiffness must be combined but in which strength is a minor consideration. Rods are constructed by splicing together chosen pieces of reed so that the correct taper from butt to the split-cane or hardwood tip is achieved. Splices and ferrules are carefully strengthened with glued hardwood plugs and the rod is whipped at short intervals before varnishing. The completed rod is fragile but in expert hands incomparably well adapted to " long-trotting " and to a fast gentle strike with fine tackle.

Mediterranean countries are the principal source of the commercial article which is also used for making reeds for wind instruments. In cultivation the species is widely spread through the warmer countries and is locally a source of woven matting and so forth.

3. Palms

The outer shells of palm trunks provide hard but rather fissile timbers of which several have been used for fishing rods. Record and Mell (1924, p. 46) mention a Black Palm (*Astrocaryum sp.*) used thus in Panama; in Puerto Rico it has been stated ((Mayaguez) 1941, p. 13) that satisfactory butt joints were made from laminated and glued strips of the wood of the Royal Palm, *Roystonea borinquena* Cook ; Trotter (1941, p. 214) mentions a *Caryota sp.* which may be the *Caryota urens* L. of Troup (1907, p. 73). The Queensland Black Palm (*Normanbya normanbyi* (F. v. Muell.) L. H. Bailey) is used by Mr. A. A. Trost of Cairns to make one-piece casting rods of beautiful design and workmanship ; he tells me that the seasoning and preparation of the timber is all-important, the details of the process being Mr. Trost's own secret.

I believe that palm woods could, with advantage, be much more widely used than they are at present, so long as the naturally fissile grain of the timber is preserved as nearly intact as possible by riving out rather than sawing the strips before planing.

4. Hardwoods

1. *Ocotea rodiei* (Schomb.) Mez (Lauraceae).

This, the Greenheart of commerce, is by far the most important hardwood used for making fishing rods. It has not, even now, been completely superseded by split-cane than which it is slightly cheaper and, in the opinion of a minority of fly fishermen, pleasanter in use. It is heavier and much more brittle than split-cane and takes a set more easily.

The tree is native to the rain forests of Guiana and Brazil and attains great size. The timber is mostly used for heavy constructional work especially in contact with sea water and to this purpose it is ideally suited by reason of its great strength and resistance to *Teredo*. Cox (1939, p. 69 seq.) states that its weight is about 65 lbs. per cubic foot when seasoned and that it has exceptional strength under bending, compression and shock loads. It has however a rather low cleavage strength and this

makes it desirable that fishing rod joints should be riven out rather than sawn. Subsequent rounding and tapering are best carried out by planing in a suitable jig—turning is said to impair the strength of the outer layers of the finished article—and by glass-scraping.

2. *Other species.*

Several other species of hardwoods have been mentioned as sources of fishing rod timber. Of these the most important is Lancewood (*Oxandra lanceolata* (Sw.) Baill. (Anonaceae) and perhaps some related genera), a heavy but rather fissile wood native to Tropical America. According to Record and Mell (1924, p. 165) the timber is imported to the U.S.A. as " lancewood spars " which are poles with the bark left on ; only the pale sapwood is used, the dark brown, green or blackish heartwood being discarded.

Other tropical American species to which I have found reference are : Degame or Lemonwood (*Calycophyllum candidissimum* (Vahl) D.C. (Rubiaceae)) of which the pale sapwood is used occasionally for fishing rods but is much better known as a source of bows (Record and Mell 1924, p. 165) ; *Brosimum paraense* Huber (Moraceae), *Dipteryx odorata* Willd. (Leguminosae-Papilionatae), *Hibiscus elatus* Sw. (Malvaceae) and *Mimusops spp.* (esp. *M. globosa* Gaertn. (Sapotaceae)), all mentioned as minor fishing rod timbers by the same authors (*loc. cit.* pp. 140, 304, 411 and 500) ; and *Petitia domingensis* Jacq. (Verbenaceae), found in Puerto Rico to be good for butt joints ((Mayaguez) 1941, p. 13).

In India, according to Troup (1907, p. 73 seq.) and Trotter (1941, p. 214) the following have been used or at least have shown promise :— *Thespesia populnea* (L.) Soland. (Malvaceae), *Grewia sp.* (Tiliaceae), *Acacia catechu* Willd. (Leguminosae-Mimosoideae), *Hardwickea binata* Roxb. (Leguminosae-Caesalpinioideae), *Heritiera minor* Lam. (Sterculiaceae), *Berrya ammonilla* Roxb. (Tiliaceae), *Heterophragma adenophylla* Seem. (Bignoniaceae), *Terminalia mannii* King (Combretaceae), *Sageraea elliptica* Hook. f. & Thoms. (Anonaceae) and *Parrotia jacquemontiana* Decne. (Hamamelidaceae).

In Queensland, Mr. A. A. Trost informs me that he has used Ghittoe, (*Halfordia scleroxyla* F. v. Muell. (Rutaceae)) with success, the closely allied Saffron Heart or Kerosene wood (*Halfordia drupifera* F. v. Muell.) being much inferior for this purpose, though commonly marketed as the same timber.

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THE GENUS COLA IN KENYA, UGANDA AND TANGANYIKA.

J. P. M. Brenan

In Bull. Jard. Bot. Brux. **18,** 4–5 (1946) the late Mr. A. P. D. Jones and the writer gave an artificial key to the native species of *Cola* of Tanganyika Territory. Since then four further species have been found in Tanganyika, and also important additional material of others. It seems, too, desirable to extend the scope of the treatment to include the Kenya and Uganda species. The following revised and amplified key has therefore been constructed :—

Flowers racemose or paniculate ; inflorescence-axes well developed, 2 cm. long or more, but not themselves woody and perennial :

Perianth (including lobes) 14–18 mm. long, glabrous or subglabrous (except for papillae) inside, tube about 7–10 mm. long, lobes reflexed ; anthers in one whorl (in ♀ flowers visible under the ovary) ; leaves on flowering shoots soon glabrous or almost so on both sides, often deeply lobed . . . 1. *C. scheffleri* K. Schum.

Perianth (including lobes) 4–8 mm. long, densely stellate-pubescent inside, tube about 3–5 mm. long, lobes not reflexed ; anthers in two superposed whorls (in ♀ flowers visible under the ovary) ; leaves on flowering shoots densely grey- to brownish-grey-tomentellous beneath, usually not lobed . 11. *C. gigantea* A. Chev.

Flowers fascicled or solitary, the pedicels arising from the stems, or sometimes (2, *C. stelechantha*) from woody, perennial, gnarled and branched inflorescences up to 1·5 cm. high, arising from old wood ; anthers always in one whorl :

Petioles always short, 3–5 mm. long ; perianth-lobes with an irregularly crisped membranaceous-hyaline margin in their upper part 8. *C. ululoma* Brenan

Petioles regularly variable in length, the ones near the ends of shoots very short, but the lower ones always exceeding 1 cm. and sometimes up to 10 cm. long ; perianth lobes without a crisped membranaceous margin above :

Perianth-tube very short, 0·5–2 mm. long ; anthers 4–6 (except in 2, *C. stelechantha*) :

Leaves (except sometimes for small atypical ones near the ends of shoots) more or less cuneately narrowed below to a narrow obtuse or subacute base, oblanceolate- or obovate-elliptic to oblong-elliptic, with 6–12 primary lateral nerves on either side of the midrib :

Flowers medium-sized, lobes 5–10·5 mm. long in fully open flowers ; pedicels about 0·7–1·5 mm. in diameter ; androphore subglabrous to pubescent :

The flowers arising from woody perennial ± gnarled and branched inflorescences up to 1·5 cm. long arising from the old wood ; young branchlets slightly puberulous ; anthers 9 ; fruiting carpels unknown 2. *C. stelechantha* Brenan

The flowers not as above, but fascicled in axils of leaves and on twigs below the leaves ; very young branchlets tomentose or tomentellous ; anthers 5–6 ; fruiting carpels sessile or subsessile, small, 1–2-seeded :

Indumentum on outside of flowers and pedicels intensely rusty ; rays of stellate hairs short, much less than the diameter of the pedicel ; fruiting carpels 1·4–2 cm. high, 1·1–1·8 cm. long, with a mucro at apex 1–1·5 mm. long ;seeds 13–16 mm. long . 3. *C. greenwayi* Brenan

Indumentum on outside of flowers and pedicels grey to pale brown ; rays of stellate hairs longer, often equalling or exceeding the diameter of the pedicel ; fruiting carpels 0·8–1·3 (–1·6) cm. high, 0·8–1·3 cm. long, without a mucro at end ; seeds 8·5–12 mm. long 4. *C. microcarpa* Brenan

Flowers small, lobes 3–4·5 mm. long in fully open flowers ; pedicels slender, less than 0·5 mm. in diameter ; androphore glabrous (unless at extreme base) ; fruiting carpels (where known) ± stipitate :

Perianth-lobes 6–8, 4–4·5 mm. long, puberulous outside, inside with very few stellate hairs near apex only ; androphore 2·5–3·5 mm. long ; ovary puberulous ; styles 1·75 mm. long ; branchlets glabrous or almost so ; leaves often rather large, up to 17 cm. long and 7·6 cm. wide ; petiole up to 6·5 cm. long 5. *C. clavata* Mast.

Perianth-lobes 4–5, 2·5–3·5 mm. long, pubescent outside, inside with stellate hairs in upper half ; androphore 2 mm. long ; ovary tomentose ; styles extremely short (about 0·3 mm.) ; branchlets puberulous ; leaves mostly small, up to 9 cm. long and 3 (–4·2) cm. wide; petiole up to 1·8 cm. long . . 6. *C. minor* Brenan

Leaves broadly rounded and cordate or subcordate at base, ovate or ovate-elliptic, with 4–5 primary lateral nerves on either side of the midrib (in addition to the basal ones) ; perianth 4·5–6·5 mm. long, lobes ascending ; androphore glabrous, 1·8–2·4 mm. long 7. *C. discoglypremnophylla* Brenan et A. P. D. Jones

Perianth-tube 3–6 mm. long ; anthers 8–10 :

Bracts at base of pedicels few, small, 1–2 mm. long, glabrescent outside ; primary lateral nerves of leaves 5–6 on each side of midrib (in addition to the basal ones) ; perianth-lobes triangular, about 4–5 mm. long . 9. *C. usambarensis* Engl.

Bracts at base of pedicels more numerous and imbricate, larger, up to 5–6 mm. long, densely puberulous outside ; primary lateral nerves of leaves 8–12 on each side of midrib ; perianth-lobes 3·5–8·5 mm. long ; fruiting carpels ± beaked, up to 10 cm. long . . . . . 10. *C. bracteata* De Wild.

The species included in the above key are enumerated and when necessary described in the following pages. Where no indication is given after the collector or number of the specimen, it is to be found in the herbarium of the Royal Botanic Gardens, Kew. Herbaria are indicated by the abbreviations listed by Lanjouw & Stafleu, Index Herbariorum, **1,** 131–144 (1954). I am grateful to the authorities in charge of the Forest Herbarium, Department of Botany, University of Oxford, and the East African Herbarium at Nairobi, for the privilege of examining specimens in their care ; in particular my thanks are due to Mr. A. C. Hoyle for his help.

1. **Cola scheffleri** *K. Schum.* in Engl., Bot. Jahrb. **33,** 314 (1903).

This species has not been recorded again up to now since it was first collected at Derema in the Usambara Mountains of Tanganyika Territory by Scheffler in 1899 (no. 150). Schumann described the leaves as simple and oblong. In 1947 Mr. P. J. Greenway and I had the good fortune to collect a *Cola* in flower at Longuza in the Usambaras, most of the leaves of which were conspicuously lobate. It did not seem likely that this was *C. scheffleri*, but comparison of it with isotypes of *Scheffler* 150 in the herbarium of the British Museum (Natural History) and in the East African Herbarium showed that they agreed excellently, except only for the production of lobed leaves by the Longuza tree. Comparison was made with flowering specimens, both sexes being present in *Scheffler* 150. I do not consider that the Longuza tree can be separated specifically from *C. scheffleri*, which evidently has a wide range of variation in its foliage, comparable with that of *C. heterophylla* (P. Beauv.) Schott et Endl.

Sterculia lindensis Engl. in Engl., Bot. Jahrb. **39,** 592 (1907), based on a specimen collected by Busse (no. 2679) in Lindi District of Tanganyika, is most probably synonymous with *C. scheffleri*. It has not been recollected in that district, and comparison with *C. scheffleri* is difficult since that is only known in flower and *S. lindensis* only in fruit.

In the following citation of specimens, various sterile gatherings probably referable to *C. scheffleri* are indicated :—

Tanganyika. Tanga District : Sigi-Amani 21 July 1914, *Grote* 6760 (EA,—sterile). E. Usambaras, Mlinga, 760 m., 18 Feb. 1937, *Greenway* 4910 (K, FHO—sterile) :—evergreen tree up to 9 m. high in evergeen rain-forest on a steep mountain slope. By Sigi R. below Longuza Hill, 19 Nov. 1947, *Brenan & Greenway* 8347 (♂ fl.) :—tree about 21 m. high in ground-water forest ; corolla pinkish-brown outside with black-purple stellate hairs, tube red inside, lobes reflexed, brownish-pink. Morogoro District : between Turiani Falls and Mahonda Sawmill, 4 Nov. 1947, *Brenan & Greenway* 8287 (sterile) :—tree about 18 m. high in evergreen fringing forest by rocky stream.

2. **Cola stelechantha** *Brenan*, sp. nov. ; affinitatis dubiae, ob inflorescentias e ligno vetere erumpentes et perennantes, perianthium mediocre profunde divisum, petiolos saepe longos, carpellis 5 satis distincta.

Arbor parva. *Ramuli* juveniles pilis stellatis minimis brunneis aperte puberuli, serius cortice griseo-brunneo obtecti. *Stipulae* mox caducae, subulato-lanceolatae, acutae, 5 mm. longae, brunneo-pubescentes. *Folia* spiraliter disposita, rigide chartacea, obovato-elliptica, circiter 9·5–27 cm. longa, 4–12·8 cm. lata, apice breviter et subacute acuminata, acumine circiter 1 cm. longo, margine integro paulum sinuato, basim

ipsum subacutum vel acutum versus cuneata, matura pilis stellatis minimis perpaucis inferiore parte costae exceptis utrinque glabra, siccitate opaca vel vix nitidula, viridia, costa et nervis lateralibus utroque costae latere 8–9 quorum unus saepe basalis necnon rete intricato venularum utrinque sed praesertim subtus prominentibus ; petiolus longitudine variabilis, 1–12·5 cm. longus, subteres, more ramulorum vestitus sed pulvinis pilis minimis stellatis densius vestitis. *Flores masculi* adhuc tantum noti, in inflorescentiis lignescentibus nodosis et confertim ramosis usque ad 3·5 cm. latis et 1·5 cm. altis multifloris e ligno vetere erumpentibus et perennantibus insidentes ; pedicelli 6–11 mm. longi, 1–1·5 mm. diametro, pilis stellatis parvis dense puberuli, circiter 3–5 mm. supra basim articulati, basi bracteis brunneis parvis circiter 1 mm. longis late rotundatis extra puberulis praediti. *Perianthium* pro genere mediocre, profunde 5–6-lobatum, extra pilis stellatis brunneis dense puberulum ; tubus brevis, 2 mm. longus, intus glaber vel fere glaber ; lobi elliptici, 8 mm. longi, 5 mm. lati, superne latiuscule (1 mm.) marginati, parte centrali apice subacuta sed margine apice eroso-rotundato, intus papillis minimis pernumerosis necnon apicem versus pilis stellatis minimis paucis induti. *Androphorum* 3 mm. longum, 1·25–1·5 mm. crassum, praesertim basim versus sparse et minute puberulum, apice corona antherarum 9 circiter 2–2·5 mm. longarum circumcinctum, thecis " uniseriatis ". *Carpella rudimentaria* 5, pubescentia, medio inter coronam antherarum demersa. *Fructus* deest.

Tanganyika. Morogoro District : Turiani, Manyanga Forest, Nov. 1953, *S. Paulo* 182 (K, holotypus—♂ fl.) :—small tree.

The affinity of this species is uncertain. The inflorescences arising from the old wood, themselves woody, gnarled and with short close irregular branches, are however distinctive. Other species from West Africa with uniseriate anthers, simple leaves and cauliflorous inflorescences differ in having either smaller flowers or a longer tube to the perianth.

3. **Cola greenwayi** *Brenan*, sp. nov. ; *C. natalensi* Oliv. proxima, ramulis dense et persistenter stellato-pubescentibus vel -puberulis nec mox glabris, petiolis praesertim pulvinis dense et persistenter stellato-puberulis nec mox glabris, androphoro (in var. *keniensi* tantum, vide infra) omnino dense pubescenti, lobis perianthii intus parte superiore dense tomentosis nec papillis exceptis subglabris vel parce pubescentibus, carpellis fructus dimidio minoribus satis differt.

Arbor parva vel alta, 12–24 m. alta, sempervirens, ut videtur dioica. *Ramuli* necnon folia perjuvenilia pilis stellatis dense brunneo- vel ferrugineo- tomentosi vel -tomentelli ; ramuli serius griseo-pubescentes, demum glabrati, mox cortice griseo obtecti. *Stipulae* caducissimae, dum folia perjuvenilia sunt jam cadentes, subulato-lanceolatae, 5 mm. longae, brunneo-tomentosae. *Folia* spiraliter disposita, subcoriacea vel coriacea, elliptica usque oblanceolato- vel obovato-elliptica, (2·5–) 4·5 -15·5 cm. longa, 1–7 cm. lata, apice obtuse acuminata, margine integro paulum sinuato plano basim ipsum acutum vel nonnunquam obtusum versus cuneato vel leviter curvato, matura utrinque glabra, siccitate opaca vel vix nitidula, brunnea usque olivaceo-viridia, costa et nervis lateralibus primariis utroque costae latere 8–12 quorum saepissime nulli basales

utrinque sed praesertim subtus prominentibus, rete intricato venularum utrinque obscuro vel prominulo ; petiolus longitudine variabilis, 0·6–5·5 cm. longus, longitudinaliter sulcatus vel subteres, more ramulorum juvenilium vestitus, serius glabrescens sed pulvinis persistenter stellato-puberulis. *Flores* masculi flavi vel flavo-virides, pilis brunneis, fasciculati, 1–8-nati, ex axillis foliorum persistentium necnon delapsorum in ramulis annotinis exorientes ; inflorescentiae hinc sessiles ; pedicelli 8–15 mm. longi, circiter 0·7–1 mm. diametro, pilis stellatis intense ferrugineis dense pubescentes vel tomentosi, 4–7 (–9) mm. supra basim articulati, bracteis basalibus minimis obscuris. *Perianthium* pro genere mediocre, profunde 4–6-lobatum, extra dense brunneo- vel ferrugineo-stellato-tomentosum vel -pubescens ; tubus brevissimus, 0·5–1·5 mm. longus, intus basi androgynophori nonnunquam excepto subglaber ; lobi elliptici vel obovato-elliptici, apice acuti vel subacuti, 5–10·5 mm. longi, medio 2·5–5 mm. lati, crassiusculi, nervis longitudinalibus plerumque 3–5, in medio (vel duobus trientibus) superiore intus pilis pallidis vel ferrugineis dense pubescentes vel tomentosi, medio vel triente vel triente inferiore marginibus stellato-pubescentibus vel tomentosis, aliter papillis minimis subglobosis exceptis fere glabri. *Androphorum* 2·5–4·5 mm. longum, cylindricum vel apicem versus gradatim angustatum, dense pubescens vel subglabrum, apice corona antherarum 5–6 circiter 1–1·5 mm. longarum circumcinctum, thecis " uniseriatis ". *Carpella rudimentaria* 4, pubescentia vel subglabra, medio inter coronam antherarum demersa. *Flores foeminei* ut masculi, sed pedicellis nonnunquam usque ad 20 mm. longis et usque ad 13 mm. supra basim articulatis, parte supra articulum siccitate conspicue sulcato. *Carpella* 3–4, extra dense stellato-tomentosa, 1·5–2 mm. alta, biovulata, superne in stylum 1·5–3 mm. longum tomentosum subito angustata ; stigma recurvum vel patens, circiter 1 mm. longum, 0·5–1·25 mm. latum, papillosum ; carpella basi antheris 5 circumcincta. *Fructus* carpella sessilia vel subsessilia, oblique ellipsoidea vel obovoidea, 1·1–1·8 cm. longa, 1·4–2·0 cm. alta, 1–1·4 cm. crassa, basi breviter vel brevissime angustata, apice late rotundata et ibi mucrone 1–1·5 mm. longo praedita, extra plus minusve dense ferrugineo-tomentella vel -pubescentia, mono- vel disperma. *Semen* ellipsoideum, 13–16 mm. longum, 8–11 mm. latum ; testa brunneum, rugulosum ; cotyledona 2.

var. **greenwayi**

Cola sp. Brenan & A. P. D. Jones in Bull. Jard. Bot. Brux. **18,** 4 (1946) ; Brenan in Check-Lists For. Trees & Shrubs Brit. Emp. **5** (**2**) (Tang. Terr.), 594 (1949).

Androphorum glabrum sed imo basi pilis stellatis circumcinctum. Flores masculi lobis 5·5–7 mm. longis. Folia saepe minus coriacea quam in var. *keniensi* (vide infra).

Tanganyika. Lushoto District : Mkusu near Lushoto, 1520 m., 20 Nov. 1939, *Grant* H 39/39 (K, EA—♂ fl.) :—much branched evergreen tree 12 m. tall. Lushoto District, 12 Feb. 1940, Grant H 39/40 (K, EA—♀ fl. & frt.). Mkusi, locally common in dry *Ritchiea albersii, Craibia, Mimusops eickii, Cassipourea eickii* forest on a greyish-brown sandy loam on steep mountain slopes, Mkuzi, 1830 m., 2 Nov. 1946, *Greenway* 7891 (K, holotypus speciei et varietatis, EA, isotypus—♂ fl.) :—much branched evergreen tree up to 18 m. tall with a dense columnar crown, greyish-white reticulate bark inclined to flake slightly, and dense clusters of brownish-green (outside) and yellowish-green small flowers produced on the young and maturer branches below the dark green leaves ;

fruits turn reddish-crimson when ripe and are eaten by the Washambaa : vernacular name (Kishamb.) "msasani". Mkusi, locally dominant in *Podocarpus*, *Trichocladus*, *Ritchiea*, *Ochna* evergreen forest on the steep slopes of a mountain, 1680 m., 25 Feb. 1947, *Greenway* 7931 (K, FHO—frt.) :—evergreen tree up to 24 m. tall with a columnar crown, smooth, greyish-brown bark, fruits brownish-orange, very frequently badly galled when they form a congealed cluster 7·5 cm. in diameter, solitary or usually in pairs on a pedicel, solitary-seeded. Mkuzi, N.E. of Lushoto, 1600 m., 20 June 1953, *Drummond & Hemsley* 2965 (K—♀ fl.) : –small bushy-topped tree 8 m. h. behind guesthouse in garden of "Greenways" ; bark rough, scaling off in large flakes ; dioecious ; perianth pale brownish-yellow with dark brown hairs. Kwazinga, 1680 m., *Grant* A 108/46 (EA–♂ fl.). Ambangulu, W. Usambara Mts., 23 Sept. 1940, *Wallace* 943 (EA–young frt.) :—tree ; fruit in clusters, 1·2 cm. diam., spherical, brown, velvety, one-seeded. Same locality, 1110 m., 20 Feb. 1934, *Wallace* 906 (EA–sterile, thus identification not quite certain) :—tall tree.

var. **keniensis** *Brenan*, var. nov.

Cola sp., Battiscombe, Descr. Cat. Trees Kenya Col. 30 (1926).

Androphorum a basi fere usque ad apicem dense stellato-pubescens. Flores masculi lobis 6–10·5 mm. longis.

Kenya. Mount Kenya, Morigo's, 1950 m., *Rammell* 1050 (K–♂ fl.) :—tall timber tree : vernacular name (Kik.) "mwagao". Kiambu District : Limuru, 2130 m., 21 June 1918, *Snowden* 632 (K—♂ fl.) :—tree 3–6 m. high ; flowers yellow, dotted with brown hairs.

Cultivated specimens. Nairobi, River Nursery, 1710 m., *Battiscombe* 1019 (K—♀ fl.) :—small tree : vernacular name "muthakai". Nairobi Arboretum, Apr. 1940, *Gardner* 1193 (K, holotypus varietatis, FHO, isotypus—♂ fl.) ; a tree of the S. Mt. Kenya forests.

C. greenwayi is closely related to *C. natalensis* Oliv., from which it differs in those points mentioned in the diagnosis. It shows also, however, an affinity with the West African *C. angustifolia* K. Schum., differing in the normally longer petioles, longer pedicels and more arcuate lateral nerves. These three species share, *inter alia*, a deeply divided perianth, 3–4 tomentose carpels, and conspicuous hairy styles.

The vars. *greenwayi* and *keniensis* are widely separated geographically from one another. It appears as though here two populations of a single species have been isolated from each other for a sufficiently long time for minor genetical divergences to appear.

Battiscombe, Descr. Cat. Trees Kenya Col. 32–3 (1926), has a description and photograph of an unnamed *Cola*, which, my colleague Mr. J. H. Hemsley informs me, is actually *Aningeria* (*Sapotaceae*).

Specimens from Vumba, S. Rhodesia (*Wild* 1588 in *Govt. Herb.* 16134) and from a small tree in Mushitu, Hippo Pool (Western Province, Chingola District, 9 km. NNW of Chingola), N. Rhodesia, *W. D. Holmes* 478 (FHO), are very near *C. greenwayi*, and, especially the Holmes specimen, may well prove to be conspecific, but further material is desirable before making a decision about this. *White* 1155 (FHO) from Embu District (Kenya), Irangi Forest Station, 1980 m., 11 Aug. 1949, growing in camphor forest, and described as a small tree 9 m. h. but said to reach a height of 60 m. and to regenerate abundantly in shade, is very possibly *C. greenwayi* var. *keniensis*. It consists of a probably juvenile shoot, whose leaves are as much as 26 cm. long and 8 cm. wide, and some detached fruiting carpels picked up from the ground, which—but allowance must be made as they are rather distorted—are up to 2 cm. long and 1·9 cm. wide ; their size when fresh must have been larger. The Kikuyu vernacular name of this tree is said likewise to be Mwagao.

4. **Cola microcarpa** *Brenan*, sp. nov. ; *C. greenwayi* Brenan peraffinis, pilis pedicellorum praesertim pallidis vel griseis nec intense ferrugineis brachiis longioribus diametrum pedicelli saepe aequantibus vel excedentibus, carpellis fructus minoribus 0·8–1·3 cm. altis differt.

Arbor parva, usque ad 7·5 m. alta, ut videtur sempervirens et dioica. *Ramuli* necnon folia perjuvenilia pilis stellatis brunneis mollibus facilibus detersu tomentosi ; ramuli mox glabrescentes et cortice albido obtecti. *Stipulae* caducissimae, dum folia perjuvenilia sunt jam cadentes, lanceolatae, 4·5–5·5 mm. longae, brunneo-tomentosae. *Folia* spiraliter disposita, plerumque subcoriacea, obovato-elliptica (vel minora elliptica), 3–15·5 cm. longa, 1–7·3 cm. lata, apice obtuse et breviter acuminata, margine integro paulum sinuato plano basim ipsum obtusum vel nonnunquam acutum versus cuneato vel leviter curvato, matura utrinque glabra, siccitate nitidula vel opaca, viridia, olivaceo-viridia vel nonnunquam pallide brunnea, costa et nervis lateralibus primariis utroque costae latere 8–12 supra prominentes vel prominuli subtus prominentes, nervis basalibus parvis vel absentibus, rete intricato venularum supra prominulo subtus conspicuo ; petiolus longitudine variabilis, 0·5–5·5 cm. longus, leviter longitudinaliter striatus vel subteres primo more ramulorum perjuvenilium vestitus, serius glabrescens sed pulvinis persistenter puberulis. *Flores masculi* flavi, fasciculati, pauci usque multi, ex axillis foliorum persistentium necnon delapsorum in ramulis annotinis exorientes; inflorescentiae hinc sessiles ; pedicelli 3–13 mm. longi, circiter 0·5 mm. diametro, pilis stellatis griseis vel pallide brunneis quorum brachia longa diametrum pedicelli saepe aequantia vel excedentia dense tomentosi, saepius 5–7 mm. (nonnunquam minus) supra basim articulati, bracteis basalibus minimis usque ad 2 mm. longis. *Perianthium* pro genere mediocre, profunde 5–6-lobatum, extra satis dense pallide brunneo- vel pallide pubescens ; tubus brevissimus, 1 2 mm. longus, intus basi androgynophori excepto fere glaber ; lobi elliptici vel ovato-elliptici, apice acuti vel subacuti, 5–8·5 mm. longi, medio 2–4·25 mm. lati, tenuiusculi, nervis longitudinalibus 3–5 in medio superiore intus pilis pallidis stellatis satis dense pubescentes, medio inferiore marginibus stellato-pubescentibus, aliter papillis minimis subglobosis pernumerosis exceptis fere glabri. *Androphorum* 3 3·5 mm. longum, basim versus leviter dilatatum, pilis stellatis paucis basi tantum exceptis glabrum, apice corona antherarum 5–6 circiter 1 mm. longarum circumcinctum, thecis " uniseriatis ". *Carpella rudimentaria* 4, medio inter coronam antherarum demersa. *Flores foeminei* ut masculi, sed pedicellis usque ad 15 mm. longis et ad 11 mm. supra basim articulatis. *Carpella* 4, extra dense stellato-tomentosa, circiter 1 mm. alta, biovulata, superne in stylum circiter 1 mm. longum pubescens subito angustata ; stigma 1·25 mm. longum, 0·75 mm. latum, papillosum, arcuato-patens ; carpella basi antheris 6 circumcincta. *Fructus carpella* sessilia vel subsessilia, subglobosa vel ellipsoideo-subglobosa, 0·8–1·3 cm. longa, 0·8–1·3 (–1·6) cm. alta, 0·8–1·2 cm. crassa, basi haud vel brevissime angustata, apice late rotundata et sine mucrone, extra pubescentia, mono- vel disperma. *Semen* ellipsoideum, 8·5–12 mm. longum, 6·5–9 mm. latum ; testa brunneum, rugulosum ; cotyledona 2.

TANGANYIKA. Morogoro District : Turiani, P.W.D. Camp, about 550 m., 22 Feb. 1946, *Wigg in F.H.* 1519 (FHO) :—small tree in camp compound ; vernacular name (Nguru) " khavi ". Turiani, 500 m., 25 Mar. 1953, *Drummond & Hemsley* 1799 :—

small spreading tree in depauperate fringing forest ; fruits dark brown. Same locality, 460 m., Sept. 1953, *Eggeling* 6704 :—understorey in riparian forest ; small tree 7·5 m. high ; flowers yellow-green. Same locality, Nov. 1953, *Semsei* 1466 (K, holotypus) : flowers bright yellow. Same locality, Nov. 1953, *Semsei* 1489 :—very common tree. Liwali R., Turiani, Apr. 1953, *Semsei* 1151 (frt.) :—tree, riversides. Mtibwa Forest Reserve 11 Dec. 1947, *Parry in F.H.* 2271 (♂ and ♀ fls.) :—vernacular name (Nguru) " kavi ".

C. microcarpa is very closely akin to *C. greenwayi*. The pedicels and the outside of the flowers of the latter are covered by a dense indumentum of intensely rusty stellate hairs, whose rays are short, less than the diameter of the pedicel. In *C. microcarpa* the indumentum is grey to pale brown, the hairs having longer rays often equalling or exceeding the diameter of the pedicel and giving them a characteristically rather shaggy appearance. The longer hairs seem to wear away after flowering time, and the indumentum of the fruiting pedicels may thus seem shorter. The difference in colour of the indumentum of flowering specimens is (at least in the dried condition) most striking, and holds for the several gatherings examined of each of the two species. The styles of *C. microcarpa* appear shorter and less hairy than those of *C. greenwayi*, but this should be further tested. The fruiting carpels of *C. microcarpa* are in general smaller than those of *C. greenwayi* ; occasionally an exceptionally large one of the former may equal in size the smallest of the latter, but in a representative gathering the size difference is obvious. In addition the fruiting carpels of *C. microcarpa* are rounded at apex and lack the mucro of *C. greenwayi*, and the seeds of *C. microcarpa* are shorter than those of *C. greenwayi*.

Assessed individually, these differences are small, but cumulatively they justify, I believe, the recognition of *C. microcarpa* as a species. Also, the latter is recorded only from low altitudes (460-550 m.), though a note on *Wigg F. H.* 1519 suggests the possibility of it occurring at higher altitudes in the Nguru Mountains ; while *C. greenwayi* occurs mainly between 1600 and 2200 m., although *Wallace* 906 is said to occur at 1100 m. in the Usambaras.

5. **Cola clavata** *Mast.* in Oliv., Fl. Trop. Afr. **1,** 222 (1868).

The type of *C. clavata* from Portuguese East Africa is in fruit, though some fragmentary remains of perianth indicate that it had very small flowers, of the order of size indicated in the key above. The small fruiting carpels are conspicuously attenuated below into a sort of stipe.

The material from Kenya and Tanganyika has hitherto been in flower only, and no information about the fruit has been available. Fortunately, however, a specimen recently collected by Semsei in Kilosa District of Tanganyika is in fruit. The carpels, however, although probably not fully developed, are a fair match for those of the type of *C. clavata*. In addition, however, the old perianths are still persistent round the bases of the rings of carpels, and they seem to agree well with those of the flowering material cited below, and certainly not with those of *C. minor*.

Kenya. Kwale District, Mrima, Aug. 1936, *Dale in F.H.* 3552 (buds) :—tree up to 21 m. high, grey-barked ; flowers cream. Lamu District, Utwani Forest, Sept. 1934, *Mohamed Abdullah in F.H.* 3353 (♂ fl.) :—tree 12 m. high ; bark light greenish ; flowers small, green-white.

Tanganyika. Tanga District : Kivomila R., 8 km. S.E. of Ngomeni, 50 m., 29 July 1953, *Drummond & Hemsley* 3519 (♀ fl.) :—one of the main constituents of riverine forest ; tree 15 m. high ; bark brownish-grey ; ♀ flowers with perianth pale brown outside, cream inside. Same locality, habitat, date and field notes except that the

flowers are ♂, *Drummond & Hemsley* 3520. Kilosa District : Vigude, Nov. 1952, *Semsei* 1017 (frt.) :—forest edge ; very common tree. Lindi District : Ruponda, 300–600 m., 6 Aug. 1947, *Semsei in F.H.* 2175 (FHO—buds) :—very common shrub.

6. **Cola minor** *Brenan*, sp. nov. ; *C. clavatae* Mast. ut videtur proxima, ramulis persistentius puberulis, foliis plerumque minoribus, petiolis plerumque brevioribus, pedicellis calycibusque extra pilis aliquot longioribus indutis, lobis perianthii brevioribus 4–5 nec 6–8, intus pilis stellatis numerosioribus indutis, androphoro breviore, ovario tomentoso nec puberulo, stylis brevissimis differt.

Arbor parva, usque ad 9 m. alta, sempervirens, dioica ; ramuli graciles, juventute 0·75–1·5 mm. diametro, pilis parvis stellatis satis dense puberuli, pilis quam in *C. clavata* diutius persistentibus, serius glabrescentes et cortice griseo ruguloso obtecti. *Stipulae* caducissimae, lineares, 2·5–5 mm. longae. *Folia* spiraliter disposita, subcoriacea vel serius coriacea, oblanceolato-elliptica usque elliptica, (1·4–) 3–9 (–11·5) cm. longa, (0·6–) 1·2–3 (–4·2) cm. lata, supra glabra siccitate brunneo-viridia opaca, subtus opaca pilis stellatis nonnullis ima costae basi exceptis glabra, margine integro plano vel levissime recurvato tenuiter cartilagineo, costa utrinque sed praesertim subtus prominente, nervis lateralibus primariis utroque costae latere circiter 9–12 adscendentibus supra prominulis subtus prominentibus sed a secundariis aegre cernendis, basalibus saepe nullis vel inconspicuis, rete intricato venularum utrinque prominulo ; petiolus longitudine variabilis sed quam in *C. clavata* sollenniter brevior, 3·5–18 mm. longus, siccitate subtiliter longitudinaliter sulcatus, basi apiceque pulvinos incrassatos dense et minute puberulos gerens, aliter puberulus. *Flores* (♂ et ♀) fasciculati vel solitarii, ex axillis foliorum persistentium necnon delapsorum in ramulis annotinis crebre exorientes ; inflorescentiae hinc sessiles ; pedicelli circiter 3–4 mm. longi, tenues, circiter 0·5 mm. diametro, pilis stellatis brunneis dense et breviter pubescentes, 1–2 mm. supra basim articulati, basi bracteis brunneis parvis 1–1·5 mm. longis, late vel latissime ovatis concavo-convexis extra puberulis intus glabris imbricatis hinc cupulam parvam effingentibus praeditis. *Perianthium* (♂ et ♀) pro genere minimum, profunde 4–5-lobatum, extra pilis stellatis brunneis dense et breviter pubescens ; tubus brevissimus, circiter 0·5 mm. longus, intus glaber ; lobi ovati vel ovato-elliptici, apice acuti, 2·5–3·5 mm. longi, medio 1·5–2 mm. lati, satis tenues, nervis longitudinalibus plerumque 3, intus dimidio superiore pilis stellatis satis crebris vestiti necnon papillis minimis breviter obovoideis numerosissimis usque ad basim loborum ornati. *Androphorum* (floris ♂) 2–2·5 mm. longum, subcylindricum, glabrum, apice corona antherarum 4–6 circiter 0·7 mm. longarum circumcinctum, thecis " uniseriatis ". *Carpella rudimentaria* (floris ♂) 3, pubescentia. *Carpella* (floris ♀) (2–) 3, extra dense stellato-tomentosa, 1 mm. alta, biovulata, ovulis collateralibus, superne in stylum brevissimum (circiter 0·3 mm. longum) angustata ; stigmata circiter 0·6–0·75 mm. longa, 0·5 mm. lata, subsessilia, papillosa ; carpella basi antheris (4 ?)–5 circumcincta. *Fructus* desunt.

Kenya. Kwale District : Malenji Forest, Aug. 1936, *Dale in F.H.* 3550 (K, EA—♀ fl.) :—small tree up to 9 m. high in lower storey of forest ; perianth with brown rusty hairs outside, greenish. Same locality, Sept. 1937, *Dale in F.H.* 3786 (K, holotypus, EA, isotypus—♂ fl.) : –small tree in forest ; pedicels and outside of perianth yellow with light brown hairs.

7. **Cola discoglypremnophylla** *Brenan et A. P. D. Jones* in Bull. Jard. Bot. Brux. **18,** 2 (1946).

Tanganyika. Lindi District : Lake Lutamba, 200–250 m., *Schlieben* 5433 (BM, holotypus, BR, isotypus—♂ fl.) :—6–10 m. high ; flowers whitish-yellow.

Still known only from the type-gathering.

8. **Cola ulolcma** *Brenan*, sp. nov. ; ob petiolos constanter perbreves, et margines loborum perianthii inferne revolutos superne membranaceo-hyalinos necnon irregulariter crispatos inter species Africae orientalis valde distincta ; *C. mayimbensi* Pellegr., speciei gabonensi, affinis, ramulis juvenilibus et petiolis glabris vel fere glabris nec dense pubescentibus, nervis secundariis basalibusque minus numerosis vel fere absentibus, bracteolis multo latioribus conspicue multivenosis differt.

Arbor parva, sempervirens, dioica. *Ramuli* graciles, juveniles glabri vel pilis stellatis perpaucis hic illic instructi, mox cortice griseo-brunneo obtecti. *Stipulae* caducissimae. *Folia* spiraliter disposita sed flexu ut videtur alterna et disticha, rigide chartacea, elliptica usque obovato- vel oblanceolato-elliptica, 4–10·5 cm. longa, 1·5–4·8 cm. lata, apice sensim obtuse acuminata, basim acutum vel subacutum versus cuneata vel levissime rotundata, margine integro, matura utrinque glabra vel fere glabra, siccitate viridia opaca vel parum nitidula, costa et nervis lateralibus primariis utroque costae latere 5–8 quorum nulli basales utrinque sed praesertim subtus prominentibus, rete venularum utrinque prominulo ; petiolus pro genere insigniter brevis necnon longitudinis constans, 3–5 mm. longus, glaber vel fere glaber. *Flores masculi* adhuc tantum noti, roseo-brunnei, fasciculati, 1–3 (–5)-nati, ex axillis vel supra foliorum persistentium necnon delapsorum in ramulis annotinis exorientes: inflorescentiae hinc sessiles ; pedicelli 3–7 mm. longi, 0·25–0·3 mm. diametro, pilis stellatis ferrugineis puberuli, tantum 1–1·5 mm. supra basim articulati, bracteis basalibus latissime ovatis imbricatis 1–2·5 mm. longis prominenter ac conferte multivenosis. *Perianthium* pro genere parvum, profunde 5-lobatum, extra pilis parvis stellatis ferrugineis dispersis puberulum ; tubus cyathiformis, 2 mm. longus, apice 3 mm. latus, intus papillis densis minutissimis breviter clavatis vel obovoideo-subglobosis exceptis glaber ; lobi patentes vel erecto-patentes, 3–4 mm. longi, 2 mm. lati (explicati), more tubi induti, marginibus praesertim inferne revolutis superne late hyalinis et irregulariter crispatis, nervis longitudinalibus 3–5. *Androphorum* 1·5–1·75 mm. longum, 0·4–0·75 mm. crassum, glabrum, apice corona antherarum 5 circiter 0·5 mm. longarum circumcinctum. *Carpella rudimentaria* 5, pubescentia. *Flores feminei* necnon *fructus* desunt.

Tanganyika. Pangani District : Bushiri Estate, *Mrs. Faulkner, Kew No.* 654 (K, holotypus—♂ fl.) :—a small tree found in shady forest, dioecious, but only male flowers seen; colour pinkish-brown.

It is hard to suggest any certain affinity for this very distinct new species. In most species of *Cola* the petioles are strikingly variable in length on one and the same shoot ; here they are constantly short. This, taken with the apparently distichous and alternate arrangement of the leaves, is alone sufficient to separate it from the other species of *Cola* known to grow in East Africa. In addition, the perianth-lobes are most characteristic : above the point where they join to form the perianth-tube, the lobe-margins are conspicuously revolute ; in their upper part

the lobes are bordered by a thin white margin which is irregularly crisped and twisted. This also is unique among the East African Colas.

C. uloloma is in fact not closely related to any other East African species, but has a surprising though seemingly natural affinity with *C. mayimbensis* Pellegr. from the Gaboon, the type specimen of which, *Le Testu* 7765, I have had the privilege of examining, thanks to the courtesy of the authorities of the Muséum National d'Histoire Naturelle at Paris. *C. mayimbensis* differs in having densely pubescent young branchlets and petioles, more numerous and more conspicuous secondary and basal lateral nerves to the leaves, and much narrower and less conspicuously venose bracteoles. *C. mayimbensis* was described as having 8 stamens, but a flower which I examined had but 5. The flowers of the type of *C. mayimbensis* are perhaps not fully open, but the perianth-lobes are suberect and not spreading as in the flowers of *C. uloloma*. There is also a possible though not very close affinity with a new species of *Cola* from Nigeria awaiting publication elsewhere (*Jones & Onochie* FHI. 5838*), which however differs in having the acumen of the leaves dilated at apex, the petioles densely puberulous, the perianth-lobes not conspicuously marginate etc. : the leaves of that plant are also more rounded towards the base.

9. **Cola usambarensis** *Engl.* in Engl., Bot. Jahrb. **39,** 595 (1907).

Tanganyika. Lushoto District : Amani, Oct. 1905, *Engler* 3423 (B, holotypus, not seen and now destroyed). Kwamkoro, 12 Nov. 1907, *Zimmermann* 6759 (EA—buds) :—small tree. Amani, 910 m., 21 Dec. 1928, *Greenway* 1069 (K, FHO, EA—♀ fl.) :—tall forest tree, common in rain-forest, with brownish-cream flowers produced on old and young branches. Amani, 910 m., 18 Dec. 1928, *Greenway* 1049 (K, FHO, EA—fl. not seen) :—tree 15 m. high, much branched, in rain-forest ; flowers cream.

The three specimens collected by Mr. P. J. Greenway and Zimmermann are determined *e descriptione*. The species is at present only known from Tanganyika.

10. **Cola bracteata** *De Wild.*, Pl. Bequaert. **1,** 522 (1922) ; Eggeling & Dale, Indigenous Trees Uganda, ed. 2, 415 (1952).

Uganda. Toro District, Itwara Forest Aug. 1943, *Eggeling* 5442 (EA—frt.) :—common shrub or small tree. Same locality, c. 1460 m., 29 Jan. 1945, *Greenway & Eggeling* 7053 (K, FHO—fl.) :—tree up to 9 m. high in rain-forest ; cream flowers on old and young wood ; fruits crimson, up to 10 cm. long, pointed at apex. Same locality, July 1946, *Kakaire* s.n. (FHO) :—small tree. Hima Forest in Kibale Forest, about 16 km. E. of Fort Portal and 4/5 km. N. of Mpanga R. bridge on the Kampala road, 22 Dec. 1949, *Hoyle* 1403 (FHO, K—fl.) 1403A (FHO, K—frt.) :—small tree 7·5 m.h. (also flowering and fruiting at 3 m.), frequent in understorey ; flowers mostly below leaves, rarely axillary, monoecious, cream tinged pink outside. Ankole District, Kalinzu Forest, July 1938, *Eggeling* 3764 (fl.) :—tree or shrub to 5 m., gregarious ; flowers unisexual, clustered on older branches and main stem ; corolla yellow with a red edge to the lobes.

Also in the Belgian Congo.

11. **Cola gigantea** *A. Chev.* in Bull. Soc. Bot. Fr., 55, Mém. **8,** 32 (1908).

[*Cola cordifolia* sensu Eggeling & Dale, Indigenous Trees Uganda, ed. 2, 415 (1952), non (Cav.) R. Br.]

Uganda. West Nile District, West Madi, Metuli, *Eggeling* 889 *in F.H.* 1242 (fl.) :—tree to 18 m. ; leaves large, up to 60 cm. long and 45–50 cm. wide ; flowers white or pink, the latter probably the older ones. Bunyoro District : road to Butiaba, 1070 m., 1905, *Dawe* 779 (fl.) : —tree 12–21 m. high. Budongo Forest, Jan. 1932, *Harris* 46 *in F.H.* 442 K, EA fl.) :—common second-storey tree growing to about 24 m. high. Toro District : Bwamba, 900 m., Jan. 1939, *Sangster* 493, 499 (FHO, EA fl. : —tree 18 m. h.;

*Now published as *C. philipi-jonesii* Brenan et Keay in Hook., Ic. Pl., t.3534 (1956).

bark closely vertically furrowed ; fls. pink. Ankole District, N.W. Ankole, 970 m., 1905, *Dawe* 435 (frt.) :—tree 18–21 m. high.

The species is also found in Nigeria, the British and French Cameroons, Ubangi-Shari, the Belgian Congo and the Anglo-Egyptian Sudan ; a variety is in the Ivory Coast, Gold Coast, Togo and Nigeria.

An Encyclopaedia of Conifers.*—Gerd Krüssmann's book on the conifers is dedicated to Ludwig Beissner, a portrait of whom forms the frontispiece. Although inspired by Beissner's well known work on this group, it is not a mere revision of it, but an entirely new treatment. A preliminary 16 pages are devoted to a resumée of conifer classification, in which Florin is followed. Then follows an encyclopaedic arrangement of the conifers that are hardy or half-hardy in Germany and Central Europe, which could have been dull, were it not enlivened by the numerous illustrations that form such a commendable feature of the book. The illustrations are drawn from many sources and include line drawings, maps and photographs. Some of the photographs reach a high standard of excellence ; the plate of *Picca omorika*—fig. 222—in particular, is noteworthy for its pictorial presentation of the habit and habitat of the tree. The line drawings of cones and of the shape and arrangement of the leaves, in such genera as *Chamaecyparis*, *Juniperus*, and *Thuja*, are valuable aids to identification. Some of the bud drawings are less successful and fail to reveal the critical characters, through being reproduced on too small a scale. Short descriptions of the genera are given, followed by those of the species and their subdivisions in alpahbetical order. Dichotomous keys are almost entirely wanting, but the larger genera are provided with tabulated data on some of the critical features. Under *Pinus*, for example, characters of the shoots, buds and needles are thus summarised. In conjunction with the illustrations, these tabulations will generally lead the user to a correct determination, but will not eliminate all the difficulties of the beginner. The nomenclature, in general, follows that adopted by Rehder and, at the specific level, leaves little to criticise. Subspecific categories, however, are all treated as polynomials, without indication of the rank of the taxon, which elsewhere, may have been described as a subspecies, variety or form. The majority are best treated as *formae*. Some of these names are correctly hyphenated, but others are not, even when adjacent in the text, as with the two forms " *aurea nova* " and " *aureo-spicata* " of *Chamaecyparis lawsoniana* on p. 84. The author, also, appears to be unaware that, under the present rules of nomemclature, it is necessary to cite in full the place of publication of a basonym, when making a new combination. The new combinations invalidated by this rule should be correctly published in a scientific journal. It is a pity that a book, otherwise so excellent, should have been marred by such nomenclatural blemishes, when they could have been avoided so easily by seeking expert advice. In spite of these nomenclatural criticisms, which apply in some measure to several important works on the *Coniferae*, Krüssmann's book is a valuable addition to the literature of the group and should find a wide public.

R. Melville.

* " Die Nadelgehölze " by Gerd Krüssmann, pp. 304, 352 figs. ; Berlin, Paul Parey, 1955 ; DM. 39.60.

NOTES ON AFRICAN STRYCHNOS*: IV.

The late Miss E. A. Bruce†

A. **Strychnos** § **Syringiflorae** *Duvign.*

This section of *Strychnos* has the following characteristics :—

Woody climbers with bifurcate tendrils. Inflorescence many-flowered, axillary. Corolla-tube subcylindrical, densely pilose within. Stamens inserted in the sinuses of corolla, exserted. Fruit globose with a woody shell, many-seeded.

There is only one East African species, *S. scheffleri* Gilg, which belongs to this section. *S. subaquatica* from the Belgian Congo and *S. sumbensis* from Angola are not, in my opinion, specifically distinct from this and I have reduced them both to a single variety.

Strychnos scheffleri *Gilg* in Notizbl. Bot. Gart. Berl. **3** : 84 (1900) & Bak. in Fl. Trop. Afr. **4** (**1**) : 537 (1903) *nomen* ; Gilg in Engl. Jahrb. **36** : 94 (1905).

Key to Varieties.

Inflorescence congested, 2–3 cm. long ; corolla-lobes not reflexed ; filaments rarely longer than the anthers, scarcely exserted ; style pilose below . . . . . var. **scheffleri**

Inflorescence spreading, 3–6 cm. long ; corolla-lobes reflexed ; filaments usually longer than the anthers, well exserted ; style pilose almost to the apex . . . . . var. **expansa**

var. **scheffleri** ; *inflorescentia congesta*, 2–3 *cm. longa.*

Kenya. Kwale District : Shimba Hills, Makandara, Aug. 1929, *Graham* 2045 ! ; Cha Simba forest, 2 Feb. 1953, *Drummond & Hemsley* 1094 !

Tanganyika. Lushoto District : near Amani, *Warnecke* 389 (iso-syntype of *S. scheffleri* in EAH !) ; Tanga District : west slopes of E. Usamabaras, Ngua Estate, 19 July, 1953, *Drummond & Hemsley* 3354 !

var. **expansa** *E. A. Bruce, var. nov.* ; *inflorescentia expansa*, 3–6 *cm. longa.*

S. subaquatica De Willd. in Bull. Jard. Bot. Brux. **5** : 43 (1915) ; Bull. Soc. Roy. Bot. Belg. **85** : 32, fig. 11 (1952).

S. sumbensis Good in Journ. Bot. **67,** suppl. **2** : 104 (1927).

French Cameroons. Near Ja River, Bitya, 19 Feb. 1921, *G. L. Bates* 1746 !

Belgian Congo. Yangambi, source of the Mbutu, 29 Sept. 1937, *Louis* 6204 ! (**holotype** of variety in Kew Herb.) ; Isalowe, 8 Oct. 1938, *Louis* 11650 !

Angola. Zaire District : Sumbo, Peco, 1926, *Gossweiler* 9148 a & b (holotype of *S. sumbensis* in BM !).

The varietal epithet refers to the more open, spreading inflorescence.

Note. *Vaughan* 1332 from Pangajun, Zanzibar, described as " Liane, thick woody tendrils ; in cave-well ", may also belong to this species. The specimen has neither flowers nor fruits, so it is difficult to place it with certainty ; the bifurcate tendrils are present and the leaves, although less

* Continued from Kew Bull. **1955** : 627 (1956).

† The manuscript of this paper has kindly been prepared for the press by Mr. J. Lewis. — Ed.

acuminate and not as strongly 3-nerved as in typical *S. scheffleri*, compare fairly well with those of some specimens of our species.

B. **Strychnos** § **Heterophylla** *Duvign.*

This section of *Strychnos* has the following characteristics :—

> Scandent shrubs or climbers with usually numerous bifurcate tendrils. Leaves very variable in size and shape, those on the main stem small, broader than long, kidney or heart-shaped, those on the slender lateral shoots longer than broad, ovate to ovate-lanceolate. Inflorescence many-flowered, terminal and axillary. Corolla-lobes longer than the tube. Stamens inserted in the corolla sinuses, well exserted. Fruit small, globose, ? 1–10-seeded. Seeds compressed.

The only East African species in this section is *S. panganensis* Gilg, which includes the following synonymy :—

Strychnos panganensis *Gilg* in Engl. Pfl. Ost-Afr. **C** : 311 (1895) ; Bak. in Fl. Trop. Afr. **4** (**1**) : 526 (1903) ; Engl. Jahrb. **36** : 94 (1905) ; Tanganyika Check List **2** : 274 (1949).

S. guerkeana Gilg in *l.c.* ; Bak. in *l.c.* : 521 ; Engl., *l.c.* ; Tanganyika Check List **2** : 277 ; Duvign. in Bull. Soc. Roy. Bot. Belg. **85** : 27 (1952).

S. bicirrifera Dunkley in Kew Bull. **1935** : 263 (1935) ; Trees & Shrubs of Kenya, ed. **2** : 126 (1936) ; Duvign. in *l.c.* & fig. 8B.

Kenya. Kwale, Nov. 1928 (fl.), *Graham* 1581 ! ; Kilifi District, 30 Nov. 1945, *Jeffery* K417 & Mar. 1930 (fl.), *Graham* 2290 (holotype of *S. bicirrifera* in K !, isotypes in EAH ! & FHO) ; Kwale District : Mazeras, *East Afr. & Uganda Nat. Hist. Soc.* 503 !

Tanganyika. Lushoto District : between Daluni & Mashewa, 26 Oct. 1935 (fl.), *Greenway* 4135 ! ; Bagamoyo District : Udoë, Rossako, *Stuhlmann* 8053 [holotype of *S. guerkeana* in B, destroyed ; isotype (fragment and drawing) in K!] ; Pangani, 6 Dec. 1889 (fl.), *Stuhlmann* 596 (isotype of *S. panganensis* in HBG !) ; Tanga District : 5 miles SE of Ngomeni, 31 July 1953 (fr.), *Drummond & Hemsley* 3572 ! ; Lindi District: 40 km. west of Lindi, 4 Dec. 1934, *Schlieben* 5696 !

Portuguese East Africa. Madanda Forest, 5 Dec. 1906 (fl.), *Swynnerton* 1073 ! ; Niassa Province, Mocimboa da Praia, 12 Sept. 1948, *Pedro & Pedrogao* 5188 !

S. panganensis is confined to the coastland of Kenya, Tanganyika and Portuguese East Africa. The species was originally described by Gilg as an erect shrub without tendrils and was therefore widely separated from *S. guerkeana* in Baker's key in the Flora of Tropical Africa. I have examined a wide range of material of this species and have observed that although the majority of specimens do possess the bifurcate " watch-spring " tendrils there are a number in which these are absent. Excellent material collected by Messrs. Drummond & Hemsley has some twigs identical with the isotype of *S. panganensis*, though others are abundantly supplied with tendrils and are comparable with a drawing of part of the type of *S. guerkeana* at Kew and to *Busse* 2909, which specimen was later cited by Gilg in Engler's Jahrbücher as also belonging to *S. guerkeana*. In this same work Gilg suggests that *S. panganensis* and *S. guerkeana* are probably synonymous in spite of the absence of tendrils in the former. I feel certain that this is the case, and have adopted the epithet *pangenensis* for the species because the type of *S. guerkeana* was destroyed at Berlin and I have been unable to trace a duplicate.

The later-described *S. bicirrifera* is undoubtedly synonymous with the above as it has the characteristic short corolla-tube, exserted stamens, terminal inflorescence and heterophyllous foliage of the species. In the original description it was differentiated from *S. matopensis* ; neither *S. guerkeana* nor *S. panganensis* were mentioned.

The fruits of this section are stated by Duvigneaud to be 1–2-seeded and Baker described those of *S. guerkeana* as 1-seeded. Although Gilg's original description says, "with the seed laterally compressed". I have found from 2–10 laterally compressed seeds in the fruits I have dissected.

C. **Strychnos xylophylla**

Strychnos xylophylla *Gilg* in Engl., Bot. Jahrb. **28** : 122 (1899) ; Fl. Trop. Afr. **4** (**1**) : 526 (1903) ; Tanganyika Check List **2** : 277 (1949).

Tanganyika. Uzaramo District : Kikulu, Feb. (fr.), *Stuhlmann* 6853 (holotype in B) ; Utete Road, 10 miles from Dar-es-Salaam, 24 Feb. 1939 (fr.), *Vaughan* 2763 (neotype in BM !).

The holotype of *S. xylophylla* Gilg was unfortunately destroyed at Berlin during the war and it has not been possible to trace any duplicates. I therefore propose *Vaughan* 2763 as the neotype of *S. xylophylla*. This specimen was collected from the same area as the type and agrees very well with the description, particularly in the following points :—

1. Erect glabrous shrub with neither spines nor tendrils.
2. Yellowish subtetragonal branchlets.
3. Large, yellow, coriaceous leaves, 6–8 cm. long, 4–6 cm. broad, densely reticulate above, inconspicuously so below.
4. Elongate, spreading inflorescence 6–10 cm. long.
5. Small, globose, 3-seeded fruit, 1·5 cm. diameter ; seeds compressed, 10 × 8 mm.

Vaughan 2763 is the only material I have seen of this species ; I have not been able to observe the flowers and cannot therefore place the species in its correct affinity. The fruits and seeds rather resemble those of *S. panganensis*, whilst the leaves and branchlets are more reminiscent of a large-leaved form of *S. henningsii*. A specimen from Sindeni Hill, Handeni District (*Burtt* 5419) resembles the Vaughan specimen in leaf size, shape, texture and venation, but has a congested (very young) inflorescence and only a slight tinge of yellow in the leaf. It would be most valuable if collectors could obtain further material of this species both in flower and fruit. The conspicuous yellow leaves, elongate infructescences of small, globose, 3-seeded fruits should make it easy to recognise.

D. **Strychnos** § **Micranthae** *Duvign.* Ser. **Malacocladae** *Duvign.*

This Series of the Section *Micranthae* is distinguished by the following characters :—

> Unarmed lianes or semi-scandent shrubs, more rarely small erect trees, with occasional simple tendrils. Inflorescence axillary, paniculate. Flowers small. Corolla rotate or sub-

rotate, lobes thinly pubescent within. Stamens inserted in the corolla sinuses, very shortly exserted. Fruit small, globose, 1-seeded.

In 1947 Duvigneaud[1] discussed the Section *Malacocladae* very fully in his paper entitled " Le Groupe du Strychnos malacoclados Wright en Afrique Equatoriale ", five years later[2] he reduced the Section to a series within the Section *Micranthae* but still held rather a restricted view on the limits of the species contained therein. I have examined the Kew, British Museum (Nat. Hist.) and East African Herbarium material of this group, in addition to a number of types kindly loaned by the Herbarium at Brussels, and I feel that a wider view is necessary and that a number of species should be relegated to synonymy. I have dealt with the three East African species below :—

(1) I consider that *S. matopensis*[3], provisionally placed in this Section by Duvigneaud, should be transferred to the Section *Penicillatae* series *Tchibangenses*[4] for the following reasons :—

The corolla-tube is densely bearded in the throat and much longer than the rather thick deltoid lobes.

The stamens are inserted in the upper part of the tube below the sinuses ; the anthers are large, subtriangular, bearded at the base and included.

The fruits are small, ellipsoid, with 1 2 ellipsoid, compressed seeds.

(2) *S. decussata* (Pappe) Gilg, an erect glabrous shrub or small tree with neither spines nor tendrils has its centre of distribution in South Africa and only reaches East Africa at its northern limit. The synonymy is as follows :—

S. decussata (*Pappe*) *Gilg* in Engl., Bot. Jahrb. **28** : 121 (1899) ; Verdoorn in Bothalia **3** (**4**) : 587 & fig. 2 (1939).

Atherstonea decussata Pappe, Sylv. Cap., ed. **2** : 29 (1862).

Strychnos atherstonei Harv., Thes. Cap. **2** : 41, t. 164 (1863) ; Fl. Cap. **4** (**1**) : 1051 (1909) ; Duvign. in Bull. Soc. Roy. Bot. Belg. **85** : 30 (1952).

Kenya. Kitu District : Nzui, 19 Jan. 1943 (fr.), *Bally* 1939 ! ; Teita District : Voi, Mazinga Hill, 31 Jan. 1953 (fr.), *Bally* 8622 !

Tanganyika. Moshi District : Mbuyuni, 18 Nov. (fl.), *Scott Elliot* 6235 !

Portuguese East Africa. Tete District : Nyaponzo Hill, 24 Sept. 1948 (fr.), *Wild* 2606 *in G. H.* 21894 ! ; between Limpopo and Nuanetsi Rivers, July 1932 (fr.), *Smuts* P. 337 !

Southern Rhodesia. Sabi-Lundi junction, Chuanje range, 12 June 1950 (fr.), *Wild* 3494 *in G. H.* 28272 ! ; Chitsa's kraal, 8 June 1950, *Wild* 3397 *in G.H.* 28251 !

Transvaal. Zoutpansberg District : behind Punda Maria Camp, 7 June 1948 (fr.) *Codd* 4252 ! ; south east of Klapperfontein, 29 April, 1953 (fr.), *H. P. van der Schijff.*

Zululand. Wall's Farm, 27 Oct. 1944 (fl.), *Gertsner* 4951 !

Natal. Umgaye, Ifafa, 5 Mar. 1910 (fl.), *Rudatis* 1226 ; Umhlanga Rocks, near Durban, 21 Mar. 1937, *Marriott* 6 ! ; near Durban, *Gerrard & McKen* 847 (isotype of *S. atherstonei* in K! !.

Eastern Cape. Alexandria : Olifants' Hock, Nov. 1888 (fr.), *Nightingale* 1000 ! ; Bathurst : Kowie River, *Atherstone* s.n. (isotype of *S. decussata* in K !) ; Kynsna : Thesen's Forest, Brackenhill, *Forestry Dept.* 8342 !

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[1] Lejeunia **11** : 55 (1947).
[2] Bull. Soc. Roy. Bot. Belg. **85** : 30 (1952).
[3] Lejeunia **11** : 77 ; Bull. Soc. Roy. Bot. Belg. **85** : 30.
[4] Bull. Soc. Roy. Bot. Belg. **85** : 23.

(3) The third problem is more complicated and is centred round the species *S. angolensis* Gilg. Duvigneaud described two new species in this group, reduced three to varietal rank and made three new varieties, at the same time upholding five other species as distinct and, in the case of one, creating two new varieties. The characters on which he based these distinctions were, in the main, variations in the following:—length of inflorescence and number of flowers ; density of pubescence ; shape, size and texture of leaves. Among the specimens I have examined from Angola (the type area), I have found variation in length of inflorescence from 1–5 cm., variation in leaf shape (on the type specimen alone) from oblanceolate to broadly ovate, variation in leaf size (on one specimen alone) from 1·5–7 cm. in length and 1–2·5 cm. in breadth. The texture of the leaf and the density of the pubescence are, to a great extent, controlled by habitat and climatic conditions, and this should be borne in mind when these variations are considered. On one specimen (*White* 3119) from Bangweulu, Northern Rhodesia, the leaves vary in texture from submembranous to thickly coriaceous, the former being shade leaves from a sapling. I have been unable to find clear cut distinctions between the species and varieties mentioned below, so have reduced a number to synonymy and am treating *S. angolensis* as a widely variable species. It is interesting to note that the flowers of this species often become fasciated.

S. angolensis *Gilg* in Engl., Bot. Jahrb. **17** : 571 (1893) ; Hiern in Welw. Cat. **1** (**3**) : 703 (1898) ; Fl. Trop. Afr. **4** (**1**) : 522 (1903) ; Duvign. in Lejeunia **11** : 67 (1947).

S. lacourtiana De Wild., Comp. d. Kasai 382 (1910).

S. bequaertii De Wild. in Bull. Jard. Bot. Brux. **5** : 42 (1915) ; Lejeunia l.c. 75.

S. likimiensis De Wild. in Bull. Jard. Bot. Brux. l.c. 48.

S. mongonda De Wild. in Bull. Jard. Bot. Brux. l.c. 50.

S. cinnabarina Gilg ex Hutch. & Dalz. in Kew Bull. **1937** : 335 (1937) ; Lejeunia l.c. 64, t. 15, fig. 20–22.

S. nauphylla Duvign. in Lejeunia l.c. 62, t. 15, fig. 25.

S. tuvungasala Duvign. in Lejeunia l.c. 76, t. 15, fig. 17–19 ; t. 16, fig. 5.

S. angolensis var. *latifolia* Duvign. in Lejeunia l.c. 69, t. 15, fig. 9.

S. angolensis var. *tanganykae* [sic] Duvign. in Lejeunia l.c. 70, t. 15, fig. 14.

S. angolensis var. *tisseranti* Duvign. in Lejeunia l.c. 70, t. 15, fig. 15–16.

S. angolensis var. *lacourtiana* (De Wild.) Duvign. in Lejeunia l.c. 71, t.15, fig. 3–8, 10–11 ; t. 16, fig. 1a, 2, 3.

S. Nigeria. Eket District, (fl.), *Talbot* s.n. !

French Cameroons. Bipinde, (fr.), *Zenker* 3430 (isotype of *S. cinnabarina* in K !) ; Kongola, April 1914 (fl.), *Mildbraed* 9026 ! ; between Jaunde and Dengdeng, Feb. 1914, *Mildbraed* 8342 !

Belgian Congo. Kasai District : Bienge, Oct. 1907, *Sapin* s.n. (holotype of *S. lacourtiana* in BR !) ; Panzi, *Vanderyst* 15826 (holotype of *S. angolensis* var. *latifolia* in BR !) ; near Likimi, 1 Mar. 1910 (fl.), *Malchair* 210 (holotype of *S. mongonda* in BR !) ; Jan. 1911, *Malchair* 504 (holotype of *S. likimiensis* in BR !) ; Katanga District : Elizabethville, near Lumbumbashi, 12 May 1912, *Bequaert* 441 (holotype of *S. bequaerti* in BR !) ; Likasi road, 14 Mar. 1928, *Ritschaert* 1628 (holotype of *S. tuvungasala* in BR !) ; Thielen St. Jacques, *Vanderyst* 21536 (holotype of *S. nauphylla* in BR !).

Tanganyika. Ulanga District : Mahenge, Mar. 1932 (fl.), *Schlieben* 1932 (holotype of *S. angolensis* var. *tanganykae* in BR !, isotype in BM !) ; Buha District : Mukugwe River, 30 miles south of Kibondo, July 1951 (fl.), *Eggeling* 6212 !

Zanzibar. Pemba Island : Chake Chake, 18 Aug. 1929 (fl.), *Vaughan* 521 ! ; 24 Dec. 1930, *Greenway* 2782 !

Northern Rhodesia. Solwezi District : Mbulungu stream, 28 June 1930 (fr.), *Milne-Redhead* 616 ! ; Mufulira, 25 Oct. 1954 (fr.), *Fanshawe* 1637 ! ; Fort Rosebery District : Lake Bangweulu, 22 Aug. 1952, *F. White* 3119 !

Angola. North Cuanza : Pungo Andongo (fl. & fr.), *Welwitsch* 6020 (isotype of *S. angolensis* in K ! & BM !) ; Tangue River, Dec. (fr.), *Welwitsch* 4766 ! & 4777 ! ; South Cuanza : Amboin, 25 June 1908 (fl.), *Gossweiler* 4462 !

Common Rhodesian Weeds*.—This book describes and illustrates 100 of the most important weeds of Southern Rhodesia, and recommends ways of keeping them under control, with particular emphasis on the use of the various modern hormone weed-killers. Its author, Dr. H. Wild, is already well-known for his valuable researches on the flora of Southern Rhodesia, and his name is a guarantee that much experience and care has been devoted to its preparation.

The descriptions of the weeds are short but adequate, and are followed by notes on distribution and origin, and suggestions for control. The text of each species is on the left-hand page, facing an illustration on the right. The latter are all from the pen of Dr. Wild himself, and praise is due to their simplicity and clarity, although their scale is not stated—some appear to be life-sized, while others are obviously reduced.

A feature of special interest is the provision of two figures illustrating the seedlings of 24 common weeds of arable land, drawn, as most users of this book will perforce see them, from above. I know of no other work where comparable illustrations of the seedling stages of African weeds can be found.

The book, which concludes with a glossary and index, is well bound and printed, but I cannot help feeling that the space might have been more economically used ; the text usually occupies only a fraction of the left-hand page, and there is usually much vacant space on the right, sometimes more than enough to accommodate the text as well.

Dr. Wild's work will certainly be of great use in Southern Rhodesia, and doubtless in neighbouring territories as well, and perhaps the best service that a reviewer can give it is to make people aware of the existence and contents of this excellent book.

J. P. M. Brenan.

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* Common Rhodesian Weeds. By Dr. H. Wild. Unpaged, with preface, introduction, acknowledgements, 102 full-page figures with accompanying text, glossary and index. Printed by the Government Printer, Salisbury, 1955. Price 15/- rexine bound, 10/- manila bound.

NOTES ON SOME TROPICAL AFRICAN SPECIES OF MOSTUEA Didr.

The late Miss E. A. Bruce.

It is interesting to note that the genus *Mostuea* possesses dimorphic flowers. This fact has been noted in some of the very excellent material collected by Drummond & Hemsley. The presence of pin- and thrum-eyed flowers must be borne in mind when comparing material from description, as previous authors have not been aware of this condition. Collectors should remember to look out for this phenomenon when gathering the genus, so that both types of flowers are represented.

Specimens cited in the subsequent part of this paper have been seen by the author.

Mostuea walleri *Bak.* in Kew Bull. **1895,** 96 (Apr.–May 1895*) ; Fl. Trop. Afr. **4** (**1**), 507 (1903).

M. grandiflora Gilg ex Engl. in Abh. Preuss. Akad. Wiss. 51 & 69 (1894) *nomen* ; Pflzw. Ost-Afr. **C,** 310 (2 Aug. 1895) ; Fl. Trop. Afr. *l.c.* ; Tanganyika Territory Check-List **2,** 272 (1949).

M. ulugurensis Gilg in Engl., Bot. Jahrb. **23,** 198 (1896) ; Fl. Trop. Afr. *l.c.* ; Tanganyika Territory Check-List *l.c.*

Kenya. Teita District : Sagalla Mt., 1560 m., 4 Feb. 1953 (fl. & fr.), *Bally* 8710 ; Mombasa District : Rabai Hills, *Rev. W. E. Taylor s.n.*

Tanganyika. Lushoto District : Usambara Mts., Lutindi, July 1893, 1300–1700 m., *Holst* 3430 (isotype of *M. grandiflora* in K) ; Western Shagai forest, 1900 m., 15 May 1953 (fl. & fr.), *Drummond & Hemsley* 2563 ; Morogoro District : Uluguru Mts., 2000 m. 11 Oct. 1935 (fl.), *Rounce* 509.

Nyasaland. Milanje District : Lugiri Gorge, Ruo river, 23 Jan. 1949 (fl.), *Mrs. Faulkner* 379.

Portuguese East Africa. Morambala Mt., 1000 m., (fl.), *Waller* s.n. (holotype of *M. walleri* in K.).

Southern Rhodesia. Umtali District : Vumba Mts., 2000 m., Dec. 1937 (fl.), *Obermeyer* 2067 *in T.M.* 37068 ; Chirinda District : Chirinda Forest, 1300 m., 23 Oct. 1947 (fl.), *Wild* 2177 *in G.H.* 18031.

The above three species were separated in the Flora of Tropical Africa by the length and pubescence of the calyx-lobes. I have found this a good character in the other species but in this particular case it does not appear to hold. A specimen collected by Miss E. M. Bruce (No. 252) from the Uluguru Mts. shows both types of calyx, i.e. with long linear lobes and with shorter ovate acuminate ones with rather denser pubescence. I have examined the holotype of *M. walleri*, the isotype of *M. grandiflora* and a fragment of the holotype of *M. ulugurensis* in addition to a fairly wide range of material and I feel that the two latter names should be relegated to synonymy. The species is recognised by the following combination of characters :—small leaves which are sparsely setose on the midrib and lateral nerves below; ascending rather stiff curved hairs on the branchlets; flowers usually 1–2-nate; calyx-lobes pilose, linear, acuminate or ovate at the base, then acuminate. The species is a characteristic component of dense upland rain forest. *Greenway* 2898 from the Eastern Usambaras differs in having smaller flowers and rather more spreading pubescence. This may be due to its lower altitude (430 m.) and to the fact that it is growing in very open rain forest.

* According to Britten in Journ. Bot. **33,** 255 (1895) this was not published till June.

Mostuea microphylla *Gilg* in Engl., Pflzw. Ost-Afr. **C,** 310 (1895) ; Fl. Trop. Afr. **4** (**1**), 505 (1903) ; Tanganyika Territory Check-List **2,** 272 (1949).

M. syringaeflora S. Moore in Journ. Bot. **44,** 24 (1906).

M. amabilis Turrill in Kew Bull. **1920,** 25 (1920).

Kenya. Mombasa District : Rabai Hills, 10 Nov. 1885 (fl.), *Rev. W. E. Taylor* (holotype of *M. syringaeflora* in BM.).

Tanganyika. Uzaramo District : Pugu [Sachsenwald], *Holtz* 870 ; Lindi District : Lindi Creek, 12 Dec. 1942 (fl.), *Gillman* 1167 ; 20 km. SW of Lindi, Mlinguru, 18 Dec. 1934 (fl.), *Schieben* 5747.

Portuguese East Africa. Near the mouth of the Msalu River, Dec. 1911 (fl.), *C. E. F. Allen* 90.

Unfortunately the holotype of *M. microphylla* was destroyed at Berlin during the war and no duplicate has been traced, so I have had to rely to a great extent on the description for my identifications, though I have seen *Holtz* 870, a poor specimen from Sachsenwald near the type area, which was named *M. microphylla* at Berlin.

The salient features of the species appear to be the rather small, subelliptic, more or less obtuse calyx-lobes, the 3–6-flowered cymes with slender peduncle and pedicels and the small to medium sized leaves with hair pockets in the angles of the lateral nerves below.

M. syringaeflora differs from the other specimens in having rather larger more acute leaves and less obtuse calyx-lobes. It is really necessary to see further material from this area in order to decide whether the above variation falls within the limits of the species. *M. amabilis* Turrill agrees well with *Holtz* 870 and I feel that this should be relegated to synonymy. The species has a coastal distribution ranging from Kenya to Portuguese East Africa.

See how to Garden.*—This is a useful little book whose purpose is to fill the practical needs of the amateur gardener by describing in simple language accompanied by 600 excellent photographs and diagrams the carrying out of the common operations of gardening. It is full of helpful hints and those who would extend their gardening joys will see from the photographs exactly how to do many of those tasks which have always appeared to be so difficult. We are instructed in the art of digging, hoeing, planting, watering, grafting and layering, while on the end papers there are sowing and planting tables. A useful index is provided.

H. S. Marshall.

* See how to Garden. By C. E. Pearson. 600 photographs and diagrams in strip series of gardening at a glance. Ward Lock & Co. Ltd., London and Melbourne, 1956. Price 21/-.

KOCHIA INDICA Wight in Egypt.

D. Thoday

Since the introduction of *Kochia indica* into Egypt, regarding which Drar (1952) has given some information, doubts have been expressed by him as to whether all the plants that have been so called have been of the same species, as some have been found with a prostrate habit or with fruits not agreeing with Wight's description. Evidence confirming the identification is being published elsewhere. Plants grown, at Alexandria and at Kew, under parallel conditions from seed obtained from Egypt and India and, at Alexandria, from Egypt and Pakistan leave no doubt as to the identiy of the Egyptian plants with *K. indica* Wight.

The object of this note is to draw attention to the range of form shown by the perianth wings that surround the fruit, as there still remains a possibility of confusion with *K. prostrata* (Linn.) Schrad., especially if occasional prostrate plants of *K. indica* are collected showing the wings more fully expanded than Wight depicts them.

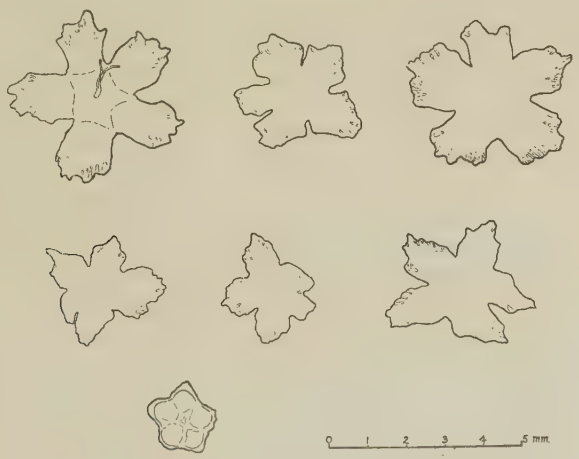

Fig. 1. *Kochia indica* Wight : fruiting perianths in outline showing range of wing-form. The upper three were from a plant that had produced relatively few fertile fruits (with seeds up to 2 mm. by 1·4 mm.), the next three from an adjacent plant, more fertile, both collected Nov. 12th, 1951, at San Stefano, Alexandria. The last represents the extreme of abortive wings, frequent towards the end of the season, from specimens collected Dec. 8th, 1951 (seeds about 1·3 mm. by 1 mm.), at Chatby, Alexandria.

These wings show a rather wide range of size and form in different specimens. Both the size of the fruit and seed and the degree of expansion of the wings are affected by the condition and stage of development of the plant as a whole.

The stellate form figured by Wight, with ovate or blunt triangular wings, is especially characteristic of developing fruits at a stage when they are abundant and impart a pinkish tinge to the whole plant on the sunward side. Even at this stage there is considerable variation. Ripe fruits may be found with wings more expanded, drying and turning brown. Towards the end of the fruiting season wings may hardly be developed at all and the seeds too are small. At the height of the season it is usually possible to find fruits with larger wings, more or less quadrate

in form. It is however chiefly in the earlier part of the season, before there are so many fruits demanding a share of the available nutrients, that fruits with more fully expanded wings have been found ; the seeds too are larger. The largest fruits were collected in mid-November, 1951, from a plant on which a large proportion of the flowers had apparently not been pollinated.

The range of size and form is illustrated in the outline drawings (Fig. 1). For comparison some typical fruits of *K. prostrata* are shown on the same scale (Fig. 2).

Reference to the type specimen of *K. prostrata* in Herb. Linn. (No. 315. 15 : *Salsola prostrata*) and comparison with specimens at Kew indicate the following as distinguishing characters of diagnostic value :

Fig. 2. *Kochia prostrata* (Linn.) Schrad. : mature fruiting perianths drawn from a photograph of the type specimen in Herb. Linn.

In *K. prostrata* the leaves are linear (sometimes appearing narrower through the margins becoming revolute) ; flowers are borne on the distal parts of the branches, in clusters in the axils of the leaves, forming spike-like inflorescences ; the wings of the fruiting perianth are broad, often sub-orbicular, finely veined over the whole surface, the outer margin varying from entire to irregularly crenate.

With this may be compared Linnaeus' description in Species Plantarum Ed. 2 : " . . . foliis linearibus . . . . . floribus conglomerato-spicatis " ; also Hooker's in Fl. Brit. Ind. **5**, 10 : flower " clusters in long leafy spikes . . . . wings . . sub-quadrate . . strongly nerved crenate . . margins of adjacent wings approximate ".

In *K. indica* the leaves are wider ; when the flowering season arrives the greater part of the plant produces flowers, 1 to 3 in each leaf axil ; the wings vary from ovate entire to sub-quadrate with the outer margin irregularly toothed or notched ; they are not veined except at the outer margin where the larger wings commonly show small translucent spots between the veins, and the adjacent margins of even the broadest wings diverge from each other.

With this may be compared Hooker's (loc. cit.) " leaves . . elliptic or linear oblong ; . . . . wings . . nerveless " ; also Wight's " leaves linear lanceolate . . . . ; flowers . . one or two in each axil ".

K. indica is typically an erect plant with spreading branches, reaching in favourable conditions a meter or more in height and spread. On the

other hand, specimens are not infrequent around Alexandria which are more or less prostrate. These are generally the result of damage to the main shoot by grazing (usually goats) or trampling. The basal branches then grow out near the ground : such plants may remain more leafy and green than erect plants at the flowering stage, when the upper leaves are smaller, grey and less conspicuous. Leaf and fruit characters however remain those typical of *Kochia indica*.

Reference

Drar, Mohammed. (1952). A report on " Kochia indica " Wight in Egypt. Bull. Institut du Desert, **2,** i, 54–8.

USTILAGO VIOLACEA (PERS.) FUCKEL ON A HYBRID DIANTHUS FROM SOUTH AFRICA.

Derek A. Reid and Sheila S. Hooper

During examination of material of the South African species of *Dianthus* from the Kew collection and the National Herbarium Pretoria, the occurrence of an anther smut on gatherings from the Worcester division of the Cape was noticed. The fungus was subsequently found to be *Ustilago violacea* (Pers.) Fuckel and as this has not been recorded* from South Africa the following notes may be of interest.

Ustilago violacea (*Pers.*) *Fuckel*

Sori in the anthers. *Spore mass* powdery, purple. *Spores* pale violet tinted, globose to subglobose 6–8·5μ, with reticulate ornamentation, the mesh of which is about 1μ in diameter. Ainsworth and Sampson (1950) give the spore size of British material as 5—12 (average 7 8)μ in diameter.

Habitat on a hybrid *Dianthus*, Worcester commonage, Karooveld, on road to Cape Town, near railway, December 1948, *R. A. Dyer* and *N. A. van Breda*, Nos. 5065 and 5066.

These gatherings appear to have come from a hybrid swarm originating from a cross between two *Dianthus* species occurring in the S.W. Cape, viz. *D. caespitosus* Thunb. and *D. bolusii* Burtt Davy. The inflorescences showing the infection (5 out of 21) all belong to plants which are closer morphologically to *D. caespitosus* than to *D. bolusii* so that, in the absence of further evidence, the host may be said to be *D. bolusii* × < *D. caespitosus*.

Reference.

Ainsworth, G. C. & Sampson, K. (1950). The British Smut Fungi (Ustilaginales). Kew.

*Since writing the above account we have been informed by P. H. B. Talbot (in litt.) that there is a collection of *Ustilago violacea* in the National Herbarium Pretoria from Basutoland. The details of this collection are as follows :—

On *Silene* cfr. *capensis*, Mokhotlong, Basutoland, March 1949. *I. Jacot-Guillarmod*, No. 1112.

Trifolium baccarinii *Chiov.* vs *T. marginatum* (Hochst. et Steud. ex Bak.) Cufod.

Dr. Cufodontis, in preparing his most valuable *Enumeratio Plantarum Aethiopiae*. (now appearing in parts in the Bulletin du Jardin Botanique de l'Etat Bruxelles) is bringing to light specific names which have been missed by the compilers of the Index Kewensis ; usually because they appeared in periodicals not principally devoted to Botany, and no separate was sent to Kew. An example is *Indigofera barcensis* Chiov. (1932) which seems to have appeared in Att. Soc. Nat. Mat. Modena **63,** 35–39. The reference is given vaguely, as Dr. Cufodontis, perhaps not realising that he is, to all intents and purposes, restoring a " lost " name to science, does not state the place of publication but leaves it to be inferred from his bibliography, in which three papers by Chiovenda appearing in 1932 are listed. In the latest part of his *Enumeratio*, B.J.B. Brux. **25,** 251, Dr. Cufodontis takes up *Trigonella marginata* Hochst. et Steud. ex Bak. F.T.A. **2,** 50 (1871) which at first sight is another such " lost " name, as it appears in the Index Kewensis only as a *nomen nudum* and is omitted from E. G. Baker's *Leguminosae of Tropical Africa*. In Dr. Cufodontis' opinion it invalidates *Trifolium baccarinii* Chiov., Ann. Bot. Rom. **9,** 57 (1911) (vide Gillett, Kew Bull. **1952,** 391) and necessitates the new combination *Trifolium marginatum* (Hochst. et Steud. ex Bak.) Cufod. However, there is an erratum note (F.T.A. **2,** 596), referred to in the index, which reads " omit *Trigonella marginata* Hochst. et Steud. which is correctly cited as a synonym of *Trifolium subrotundum* Steud. et Hochst., p. 59 ". As F.T.A. vol. **2** was published as a whole it is clear that, at the moment of publication, the author did not accept *Trigonella marginata* as a species. Presumably the description only appeared because it was impossible at that stage to remove it. Its publication is thus invalid under article 43 of the international rules " a name which is not accepted by the author who published it . . . . . is not validly published " and the name remains a *nomen nudum* which does not invalidate *Trifolium baccarinii* Chiov.

A further name taken up by Dr. Cufodontis, l.c. p. 253 is *Trifolium rueppellianum* var. *multiflorum* Fiori, N. Giorn. Bot. It. **55,** 339 (1949). This was not validly published, as no Latin diagnosis is given. The single Italian phrase which Dr. Fiori used to " describe " his new variety " Capolini con piu di 10 fiori " is true of at least 90 per cent of all specimens of *T. rueppellianum* which have so far been examined. No type is mentioned, but the variety is based on an unspecified plant from " Somalia " which Dr. Cufondontis tells us is *Ruspoli and Riva* 1362/A FI from Coromma and on *Stolz* 721K from the N. end of Lake Nyasa. The former has not been seen, the latter is cited in Kew Bull. **1952,** 390 as a form of *T. rueppellianum* intermediate between vars. *rueppellianum* and *preussii*. It has the 2-seeded fruits of the former and the calyx somewhat exceeding the corolla of the latter. On the whole it seems preferable not to give such intermediate forms (which are common in E. Africa) a name, but should this be done, it is to be hoped that an epithet more suitable than " *multiflorum* " will be found.

J. B. Gillett.

A NEW SECTION OF THE GENUS CHENOPODIUM FROM AFRICA.

J. P. M. Brenan

Chenopodium glaucum L. subsp. *congolanum* Hauman was described in Bull. Jard. Bot. Brux. **19,** 447 (1949). Recently, thanks to the Director of the Jardin Botanique de l'État at Brussels, I have received on loan the holotype of this plant, which agrees well with two other specimens at Kew, one from the British Cameroons and the other from the Belgian Congo.

Examination of these has shown that *C. glaucum* subsp. *congolanum* is specifically distinct from the hitherto known species of *Chenopodium*, and that it should be rather placed in a distinct section in the neighbourhood of Section *Botryoides* C. A. Mey.

C. glaucum subsp. *congolanum* differs from *C. glaucum* in the following points :—

(1) Leaves sparsely clothed beneath with yellowish to whitish opaque subglobose hairs resembling papillae, not densely whitish-mealy beneath.

(2) Young stems with some glandular hairs (in addition to the papilla-like hairs mentioned under 1)), not glabrous.

(3) Sepals 4, apparently not or very rarely varying from 3–5.

(4) Sepals outside with subglobose hairs as described above under 1), not glabrous.

(5) Seeds mainly vertical, not mainly horizontal.

(6) Stigmas linear, several times longer than thick, not subcapitate and about as long as thick.

These characters seem to warrant specific separation of *C. glaucum* subsp. *congolanum* ; and in addition the presence of glandular hairs, the single stamen and the elongate stigmas, indicates that it cannot be placed in the Section *Pseudoblitum* Hook. f., which includes *C. glaucum.*

The latest full discussion of the sections of *Chenopodium* is by Ulbrich in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, **16c** (1934).

The herbaceous habit, the presence of glandular hairs, the sepals free except at base, the single stamen, the glabrous ovary, and the predominantly vertical seeds indicate that *C. glaucum* subsp. *congolanum* finds its nearest affinity either in Sect. *Botryoides* or Sect. *Orthosporum.* The main difference between these two sections is in the inflorescence, the flowers being fascicled in the leaf-axils in the latter, but cymosely arranged in the former. Although Hauman described the inflorescence of *C. glaucum* subsp. *congolanum* as being composed of dense subsessile glomerules at the nodes, the larger inflorescences of the holotype are clearly cymose with visible axes, and not fasciculate, and this interpretation is fully confirmed by the additional specimens now available.

The two known tropical African species placed in Sect. *Botryoides* are *C. schraderianum* Schult. and *C. procerum* Hochst. ex Moq. From both these *C. glaucum* subsp. *congolanum* differs in having 4 sepals (normally, at any rate), which are without a keel on the back or merely " humped " near apex, seeds mainly vertical, not horizontal, and closely embraced by

the sepals, glandular hairs sparse, and the subglobose hairs considerably larger than the comparable ones shown by *C. schraderianum* alone. There are in addition other differences separating *C. glaucum* subsp. *congolanum* from each of the two species considered individually.

C. botrys L. differs from *C. schraderianum* and *C. procerum* in having no keel to the sepals, but is, however, very distinct from *C. glaucum* subsp. *congolanum* in the dense indumentum of glandular hairs, which extends all over the outside of the sepals and covers the upper surface of the leaves.

The character of whether the seeds are vertical or horizontal is one of considerable importance in *Chenopodium*. *C. glaucum* subsp. *congolanum* is in some respects a link between the sect. *Botryoides* and the sect. *Orthosporum*. Its affinity is, I suspect, more with the former, but to include a species with predominantly vertical seeds in sect. *Botryoides* would destroy its homogeneity, and the same result would be reached by including in sect. *Orthosporum* a species with cymose inflorescences.

I therefore propose to raise *C. glaucum* subsp. *congolanum* to specific rank, and to include it in a new section of the genus, *Margaritaria*, so-called in allusion to the often whitish opaque subglobose hairs scattered over the surface of the plant, which resemble tiny pearls.

Chenopodium L. Sect. **Margaritaria** *Brenan*, sect. nov. ; sect. *Botryoidae* C. A. Mey. et sect. *Orthosporo* R. Br. affinis, ab illa sepalis 4, seminibus (eis florum terminalium exceptis) rectis differt, ab hac inflorescentiis cymosis nec fasciculatis distat.

Planta ut videtur herbacea, juventute pilis glanduliferis ± sparse vestita, pilis aliis subglobosis opacis albidis vel nonnunquam aureis hic illic semper ornata. Folia pinnatim lobata. Inflorescentiae axillares, breviter cymosae. Sepala (an semper ?) 4, apicem versus dorso gibbosa. Stamen 1. Stigmata 2, linearia. Semina (eis florum terminalium exceptis) recta, testa atrobrunnea fere laevi, pericarpo facile solubili. Typus : *C. congolanum* (Haum.) Brenan.

Chenopodium congolanum (*Haum.*) *Brenan*, sp. nov.

Chenopodium glaucum L. subsp. *congolanum* Hauman in Bull. Jard. Bot. Brux. **19,** 447 (1949) ; et in Fl. Congo Belge **2,** 9 (1951).

Species in sectione ut videtur unica.

Planta ut videtur herbacea, annua. *Caules* usque ad 40 cm. vel ultra longi, praesertim juventute pilis brevibus glanduliferis plus minusve sparse vestiti necnon pilis aliis subglobosis (vide supra, sub sectione) sparsissime ornati. *Folia* petiolo 2–20 mm. longo ; lamina lanceolata usque elliptico-lanceolata vel oblanceolata, plerumque 1·5–4·3 cm. longa, 0·3–1·6 cm. lata, basi cuneato-attenuata, apice obtusa vel rarius subacuta, utroque margine 3–4 (-5) lobis conspicuis plerumque subacutis usque ad circiter 5 mm. altis, supra glabra vel fere glabra, subtus pilis subglobosis albidis crebris inspersa aliter subglabra. *Inflorescentiae* ex axillis plerisque exorientes, saepe e basi divaricatim et cymosim ramosae, usque ad circiter 13 mm. longae sed saepe breviores, axibus tenuibus subglabris. *Flores* hermaphroditi et foeminei, minimi, circiter 0·3–1 mm. diametro, virides. *Sepala* 4 (? semper), cymbiformia, apicem

obtusum versus dorso gibbere angusto sublato viridi a latere viso integro praedita, extra pilis subglobosis albidis vel aureis crebre gemmata, sed par unum oppositum densius quam alterum. *Stamen* 1. *Ovarium* stigmatibus 2 linearibus. *Semen* (eis florum terminalium exceptis) rectum, 0·8–1 mm. diametro, 0·5–0·6 mm. crassum, nitidum, atrobrunneum, testa (microscopice visa) fere laevi, asperitatibus minutissimis notata sed nec lineata nec foveolata.

British Cameroons. Bamenda, Nchan, alt. 1520 m., Apr. 1931, *Maitland* 1512 (K) :—about cultivation.

Belgian Congo. District des Lacs Edouard et Kivu : Tshibinda, *Scaetta* 1223 (BR, holotype). Lake Kivu, Idjwi Is., alt. 1680 m., 24 Feb. 1939, *Mrs. M. V. Loveridge* 587 (K) :—in edge of native garden ; flowers green.

It will be observed that the above description differs from those of Hauman in some important points, notably the presence of glandular hairs, the structure of the inflorescence, the number of sepals and the number and form of the stigmas. I am unable to confirm the presence of 5 sepals or 3 stigmas in any flower, and if these numbers do occur they must be exceptional.

Photosynthesis*.—Although photosynthesis is one of the most fundamental physiological processes in plants it is still far from being completely understood despite the energy with which the subject is being investigated at the present time. It is therefore interesting to note that Drs. Robert Hill and C. P. Whittingham, who are members of the respective departments of biochemistry and botany at Cambridge, have joined forces to survey current research on the subject in a short book of less than 200 small pages. In this book the reader is introduced to photosynthesis via the old classical work on the subject, and is led from there to such recent developments as experiments designed to follow the path of carbon in photosynthesis by using radioactive carbon as a tracer element. The main body of the text consists of 8 chapters dealing with such topics as the structure of the leaf in relation to photosynthesis, and the comparative biochemistry and physiology of the process and of the pigments associated with it. Modern views on the evolution and mechanism of photosynthesis are also discussed. The book includes a selected bibliography of more than 100 titles, and ends with a General Index and an Index to Plant Names. The book constitutes a valuable and authoritative survey of the subject which will no doubt be welcomed by advanced students, and by specialists in plant physiology and biochemistry.

C. R. Metcalfe.

* Photosynthesis, by Robert Hill and C. P. Whittingham. Methuen's Monographs of Biochemical Subjects. Pp. vii + 165 ; 1955. 8/6 net.

WEST AFRICAN LORANTHACEAE

S. Balle

The following new combinations are made for use in the revised " Flora of West Tropical Africa " :

Englerina lecardii (*Engl.*) *Balle*, comb. nov.
Loranthus lecardii Engl., Bot. Jahrb. **20** : 128 (1894).

Englerina parviflorus (*Engl.*) *Balle*, comb. nov.
Loranthus parviflorus Engl., Bot. Jahrb. **20** : 127 (1894).

Englerina gabonensis (*Engl.*) *Balle*, comb. nov.
Loranthus gabonensis Engl., Bot. Jahrb. **20** : 127 (1894).

Phragmanthera incana (*Schumach.*) *Balle*, comb. nov.
Loranthus incanus Schumach., Beskr. Guin. Pl. 180 (1827).

Phragmanthera redingi (*De Wild.*) *Balle*, comb. nov.
Loranthus redingi De Wild., in Bull. Jard. Bot. Brux. **4** : 416 (1914).

Phragmanthera lapathifolia (*Engl. & K. Krause*) *Balle*, comb. nov.
Loranthus lapathifolius Engl. & K. Krause, in Bot. Jahrb. **51** : 459 (1914).

Phragmanthera kamerunensis (*Engl.*) *Balle*, comb. nov.
Loranthus kamerunensis Engl., Bot. Jahrb. **40** : 525 (1908).

Phragmanthera polycrypta (*F. Didr.*) *Balle*, comb. nov.
Loranthus polycrypta F. Didr., in Kjoeb. Vidensk. Meddel. 194 (1854).

Phragmanthera talbotiorum (*Sprague*) *Balle*, comb. nov.
Loranthus talbotiorum Sprague, in Thiselton-Dyer, Fl. Trop. Afr. **4, 1** : 1026 (1910).

Phragmanthera rufescens (*DC.*) *Balle*, comb. nov.
Loranthus rufescens DC., Prod. **4** : 303 (1830).

Phragmanthera leonensis (*Sprague*) *Balle*, comb. nov.
Loranthus leonensis Sprague, in Thiselton-Dyer, Fl. Trop. Afr., **4, 1** : 282 (1910).

Phragmanthera nigritana (*Hook. f. ex Benth.*) *Balle*, comb. nov.
Loranthus nigritanus Hook. f. ex Benth., in Hook. Niger Fl. 377 (1849).

NEW SPECIES OF OLDENLANDIA, CONOSTOMIUM AND PAVETTA FROM TROPICAL AFRICA.

C. E. B. Bremekamp

Oldenlandia filipes *Brem.*, sp. nov. subgeneris *Eu-oldenlandiae* Brem., floribus heterostylis in umbellas longe pedunculatas dispositis et stylo hirtello *O. umbellatae* L., *O. somalae* Chiov. ex Brem. et *O. eludenti* Brem. similis, sed pedicellis multo longioribus ab eis faciliter distinguenda ; habitu *O. corymbosae* L. similior, sed floribus heterostylis et multo majoribus ab ea valde diversa.

Herba unicaulis, e basi ramosa. *Caulis ramique* ascendentes, subteretes, glabri ; internodia bisulcata, marginibus sulcorum etiam apicem versus laevibus. *Folia* linearia vel lineari-lanceolata, 10–20 mm. longa et 2–3 mm., rarius usque ad 4 mm. lata, apice acuta et mucronata, basin versus contracta, supra et margine vix notabile scabridula, concoloria. *Vagina stipularis* obconica, margine in fimbrias aliquas ei subaequilongas producta. *Inflorescentiae* pedunculatae, e floribus duobus vel tribus compositae. *Pedunculus* filiformis, folio plerumque subaequilongus, glaber. *Pedicelli* filiformes, pedunculo subaequilongi. *Flores* heterostyli. *Ovarium* glabrum. *Calycis lobi* anguste triangulares, 2 mm. longi et 0·8 mm. lati, margine et costa vix notabile scabridulo-papillosi. *Corolla* alba, rosea vel lilacina, tubo 2·2 mm. longo, fauce in flore dolichostylo distincte barbato, in flore brachystylo subglabro, infra faucem sparse piloso, lobis 2·5 mm. longis, dimidio inferiore dense pilosis. *Stamina* in flore brachystylo filamentis glabris 1·7 mm. longis ad incisuras corollae inserta ; antherae 1·2 mm. longae, in flore dolichostylo fauce inclusae. *Granula pollinis* ellipsoidea, 3- vel 4-colporata, 25–28μ alta et 20μ diametro. *Stylus* hirtellus, in flore brachystylo 1·4 mm., in flore dolichostylo 4·0 mm. longus ; stigmata 1·2 mm. longa. *Capsula* depresse globosa, 2 mm. alta et 2·6 mm. diametro, intra calycem vix notabile producta, glabra. *Cellulae testae* parietibus subrectis instructae.

Kenya. Londiani, 14 July 1951, 2300 m., *Davis* 23 (K, holotypus) :—in open grassland and roadsides, ground sometimes badly drained, common ; flowers white, pinkish or pale mauve.

Although this new species looks at first sight very much like *O. corymbosa* L., it cannot be a near ally of the latter. The floral dimorphism and the hirtellous style point in the direction of the three species mentioned above.

Conostomium squarrosum *Brem.*, sp. nov. subgeneris *Beckiae*, a speciebus subgeneris huius hactenus notis quae floribus fere omnibus sessilibus vel subsessilibus instructae sunt habitu fruticosa, corollae lobis et longioribus et latioribus distinguenda, ramis subteretibus fere totis cortice secundario vestitis ad *C. brevirostrum* Brem. accedens sed foliis angustioribus, ovario dense papilloso, corollae tubo breviore, lobis contra majoribus ab ea recedens.

Frutex ramosus, 1–2 m. altus, ramis patentibus squarrosus. *Rami* novelli circiter 1·0 mm. diametro, scabrido-papillosi, mox cortice griseo vel griseo-brunneo paulum desquamante vestiti et ultimo usque ad 2·5 mm. incrassati, subteretes et indistincte 4-costulati, internodiis 1·0–4·5 cm. longis. *Folia* ramorum principalium mox decidua, nondum visa,

brachyblastorum linearia, 1–3 cm. longa et 1·5–2·5 mm. lata, supra praesertim marginem versus densius scabridulo-papillosa, subtus ubique sparse scabrido-papillosa, margine recurvato. *Vagina stipularis* circiter 3·0 mm. alta, mox indurescens, brunnescens et inter folia findens, foliis dejectis squamarum oppositarum instar persistens. *Flores* singuli vel in triades dispositi e brachyblastis orientes, terminales et axillares, plerumque subsessiles, rarius flores aliqui pedicello et triades aliquae pedunculo usque ad 5 mm. longo elati. *Ovarium* dense papillosum. *Calycis lobi* 4·0–4·5 mm. longi, vix notabile carinati, margine vix notabile ciliolati, ceterum glabri. *Corolla* alba, extra glabra, tubo 2·5 cm. longo, lobis 12 mm. longis et 7 mm. latis, intus dense papillosis. *Antherae* in flore dolichostylo 2·5 mm. longae et totae inclusae, in flore brachystylo 3 mm. longae et apicibus orem corollae attingentes. *Granula pollinis* plurima 4-pora, aliquae 3-pora vel 5-pora ; granula 4-pora 25μ diam., granula 3-pora multo minora. *Stylus* floris dolichostyli stigmatibus 4 mm. longis apice recurvatis orem corollae attingens ; stigmata floris brachystyli 3 mm. longa, apice non recurvata, paulo supra medium tubum inclusa. *Capsula* nondum nota.

Habitat Aethiopiam.

Ethiopia. Ogaden, between Gorrahi (6° 40′ N., 44° O′ E.) and Wardere (6° 50′ N., 44° 40′ E.), 750 m., 19 Oct. 1953, *Dr. P. E. Ellis* 138 (K, holotypus) :—bush country, common in less dense parts ; shrub up to 1·2 m. ; flowers very white ; carnation-like smell. W. of Wardere (6° 50′ N., 44° 10′ E.), 750 m., 16 Oct. 1953, *Dr. P. E. Ellis* 125 (K) :—gravel and sandy soil, rare ; small tree to 2·1 m.high ; white, drooping flowers.

The floral dimorphism of *Conostomium squarrosum* Brem. is, like that of several other species belonging to the subgenus *Beckia*, of a peculiar kind, for the anthers of the dolichostylous flower occupy a higher position than the stigmata of the brachystylous one. In my "Monograph of the African species of Oldenlandia sensu Hiern" I suggested that the brachystylous flowers investigated by me might be teratological, but in view of the fact that in the brachystylous flowers of this new species too the anthers are inserted at a similar high level this interpretation can no longer be regarded as convincing.

PAVETTA

Among the *Pavettae* recently collected in East Africa several new species were recognised, and two of the latter even proved to represent new sections. The new sections and species are described below ; they are arranged in the same way as those that were dealt with in my "Monograph of the genus Pavetta" in Fedde's Repertorium **37,** 1–208 (1934). The numbers by which they are preceded indicate their position in the classification adopted in that work and in the supplements that since then have appeared.

Sectio 6a. **Maschalanthus** *Brem.*, sect. nov.

Arbor parva. *Folia* sine acaridomatiis, nodulis ambitu integro, aliquibus ad costam adjicientibus, aliquibus sparsis. *Rami* floriferi annotini, breves, ex internodio singulo constantes. *Calyx* repando-dentatus, dentibus tubo paulo longioribus.

Sectio adhuc monotypica in Africa Orientali Aequatoriali endemica.

Species unica : *P. axillipara* Brem.

This section is based on a species found in Morogoro District in the Eastern Province of Tanganyika. It differs from the species of the section *Aethiopinymphe* in the larger size of the leaves, in the absence of acaridomatia, in the arrangement of part of the nodules along the midrib, and in the short axillary flowering shoots ; from the only species of the section *Baconiopsis* in the larger size of the leaves and in their plane, not rugose surface, in the axillary flowering shoots and in the repando-dentate calyx ; from the species of the section *Chloropus* in the large size of the leaves, in the presence of nodules along the midrib, in the absence of acaridomatia and in the repando-dentate calyx ; and from those of the section *Graptophyllum*, which it resembles in the large size of the leaves and in the absence of acaridomatia, it differs in the presence of nodules along the midrib and in the shape of the nodules, which are never lobed ; from the series *Rosulatae* and from the series *Suffruticosae* of this section, which it resembles in the short flowering shoots, it differs moreover in habit : *P. axillipara* is described as a small tree.

194a. **Pavetta axillipara** *Brem.*, sp. nov.

Arbor parva. *Rami novelli* puberuli, mox cortice griseo opaco vestiti, internodiis complanatis. *Folia* in petiolum puberulum 1·5–2·0 cm. longum contracta ; lamina oblonga vel obovata, 20–30 cm. longa et 8·5–12 cm. lata, apice acuminata, basin versus sensim contracta, tenuis, siccitate olivacea vel plus minusve coerulescens, utrinque glabra, nodulis partim ad costam adjicientibus et subelongatis, partim sparsis et orbicularibus, nervis utroque latere costae 11–14. *Stipulae* triangulares, 1·5 cm. longae, apice subulatae, extra puberulae. *Rami floriferi* vix 0·5 cm. longi, virides, jugo singulo foliorum parvorum coronati. *Inflorescentia* contracta, e floribus 50–60 composita, siccitate nigrescens ; pedunculus, ramuli, pedicelli 2–3 mm. longi vix notabile puberuli. *Ovarium* etiam vix notabile puberulum. *Calyx* subglaber, repando-dentatus, tubo 1·5 mm. alto, dentibus 2·5 mm. longis, calloso-apiculatis. *Corolla* extra glabra, tubo 17 mm. longo et 2 mm. diametro, intus densius piloso, lobis 8·5 mm. longis. *Stylus* 4·2 cm. longus.

Habitat Tanganyikam.

Tanganyika. Eastern Province, Morogoro District ; Turiani, Nguru Mountains, Koluhamba, Nov. 1953, *Semsei* 1451 (U, holotypus, K, isotypus*) : —small tree ; flowers white.

The two following species belong to section 11, *Trichosphaera*.

205c. **Pavetta coelophlebia** *Brem.*, sp. nov. sectionis *Trichosphaerae*, a speciebus aliis sectionis huius floribus brevius pedicellatis distinguenda, a *P. rufipila* Brem. insuper indumento griseo et corollae tubo extra pubescente, a *P. sansibarica* K. Schum., *P. trichosphaera* Brem., *P. corythrogyne* Brem., *P. filistipulata* Brem. et *P. shimbensi* Brem. (v. infra) inflorescentiis paucifloris, a *P. sansibarica* foliis numero majore nervorum percursis, a *P. trichosphaera* stylo longiore, a *P. filistipulata* calycis lobis multo brevioribus, a *P. corythrogyne* foliis majoribus, a *P. shimbensi* foliis angustioribus et floribus majoribus diversa.

Frutex circiter 2 m. altus, indumento griseo vestitus. *Folia* petiolo densius hirsuto 1·0–1·5 cm. longo instructa ; lamina lanceolato-oblonga

* The isotype at Kew has not been examined by the author.

vel oblanceolato-oblonga, 9–14 cm. longa et 3·0–5·5 cm. lata, utroque extremo attenuata, tenuis, supra nitidula, subtus opaca, supra pilis paucis sparsis et demum plus minusve glabrescens, subtus sparse hirsuta siccitate supra saturate et subtus dilute olivacea, nervis utroque latere costae 7–10, in foliis vetustioribus immersis. *Stipulae* in aristam pilosam 8–9 mm. longam exeuntes. *Rami floriferi* ex internodio circiter 17 cm. longo constantes, apice jugis duobus foliorum coronati. *Inflorescentia* corymbosa, e floribus circiter 15 composita, hirtella. *Pedicelli* 1·5–2·0 mm. longi, hirtelli. *Ovarium* dense albo-hirtellum. *Calycis lobi* 2 mm. longi, hirtelli. *Corolla* extra praesertim tubo hirtella, tubo 20 mm. longo et 1·5 mm. diametro, lobis 10 mm. longis et 2·5 mm. latis. *Stylus* 6 cm. longus.

Habitat Tanganyikam.

Tanganyika. Eastern Province, Morogoro District, Southern Nguru Mountains, Ruhamba Peak, 1900 m., 2 Apr. 1953, *Drummond & Hemsley* 1967 (K, holotypus) :—shrub layer of upland rain-forest ; shrub 2 m. high ; calyx green ; corolla white, tube greenish at base.

This species is easily distinguishable from the other members of the section *Trichosphaera* by the short pedicels. In the small number of flowers per inflorescence it resembles *P. rufipila* Brem., from which it is easily distinguishable by the grey colour of the indumentum. In the latter character it resembles *P. sansibarica* K. Schum., *P. trichosphaera* Brem., *P. filistipulata* Brem. and *P. shimbensis* Brem. (v. infra). In the shortness of the calyx-lobes it agrees with *P. rufipila*, *P. sansibarica*, *P. trichosphaera* and *P. shimbensis*.

205d. **Pavetta shimbensis** *Brem.*, sp. nov., sectionis *Trichosphaerae*, a speciebus aliis sectionis huius foliis latioribus distinguenda, indumento griseo cum *P. sansibarica* K. Schum., *P. trichosphaera* Brem., *P. corythrogyne* Brem., *P. filistipulata* Brem. et *P. coelophlebia* Brem. congruens sed stipulis in aristam longissimam exeuntibus cum *P. filistipulata* et *P. coelophlebia* solis comparanda, a *P. filistipulata* tamen calycis lobis multo brevioribus et a *P. coelophlebia* inflorescentia e floribus pluribus composita et floribus longius pedicellatis distincte recedens.

Arbuscula usque ad 5 m. alta, indumento griseo vestita. *Folia* petiolo densius hirsuto, 1·0–2·0 cm. longo instructa ; lamina elliptico-oblonga vel elliptica, 9–17 cm. longa et 4·0–8·5 cm. lata, apice acuminata, basi acuta vel subacuta, tenuis, utrinque opaca et pilis longis sparsa, costa utraque facie densius pilosa, siccitate saturate olivacea, nervis utroque latere costae 7–10, nodulis paucis ad costam adjicientibus. *Stipulae* triangulares vel subtruncatae, in aristam pilosam 8–10 mm. longam exeuntes. *Rami floriferi* ex internodio circiter 16 cm. longo constantes, apice jugis duobus foliorum coronati. *Inflorescentia* laxe corymbosa, e floribus circiter 45 composita, hirtella. *Pedicelli* 4–7 mm. longi, hirtelli. *Ovarium* dense albo-hirtellum. *Calycis lobi* 2·5–3·5 mm. longi, hirtelli. *Corolla* extra praesertim in tubo pilosa, tubo 11–13 mm. longo et 1 mm. diametro, lobis 8·5 mm. longis et 2·5 mm. latis. *Stylus* 2·5–2·8 cm. longus.

Habitat Kenyam.

Kenya. Kwale District, Shimba Hills, Mwele Mdogo Forest, 19 km. S.W. of Kwale, 400 m., 5 Feb. 1953, *Drummond & Hemsley* 1131A (K, holotypus) :—shrub layer in *Chlorophora*, *Antiaris*, *Odyendea*, *Bombax*, *Pachystela* forest ; erect tall shrub to 5 m. ; calyx green ; corolla white, tube white merging into green at base.

Pavetta shimbensis is easily distinguishable from the other species of the section *Trichosphaera* by the greater width of the leaves ; the small size of the flower and the comparatively short style are also noteworthy characters. In the shape and size of the stipules it agrees with *P. filistipulata* Brem. and with *P. coelophlebia* Brem., but from *P. filistipulata* it differs *inter alia* in the much shorter calyx-lobes, and from *P. coelophlebia* in the larger number of flowers per inflorescence and in the greater length of the pedicels.

In the next species we are confronted once more with a representative of a new section, which may be described as follows.

Sectio 12a. **Odontocalyx** *Brem.*, sect. nov.

Frutex glaber. *Folia* opposita, petiolata, in axillis nervorum primariorum acaridomatiis instructa, nodulis omnibus ad costam adjicientibus. *Stipulae* axilla sericeo-villosae. *Rami floriferi* pedunculiformes, toti vel minime parte basali cortice secundario vestiti, ex intermodiis uno vel duobus constantes et apice jugo singulo foliorum coronati. *Inflorescentia* breviter pedunculata, laxe corymbosa, pauciflora. *Calyx* repando-denticulatus. *Corollae* tubus intus pilosus.

Sectio adhuc monotypica in Africa Orientali Aequatoriali endemica.

Species unica : *P. usambarica* Brem.

This section is based on a species collected in the Western Usambaras, Tanganyika. In the nature of the flowering shoots and in the repand-denticulate calyx this species resembles those that were referred to the series *Denticulatae* of the section *Dolichosiphon* as well as those belonging to the section *Tarennopsis*, but it is easily distinguishable from them by the presence of acaridomatia in the axils of the primary nerves. In this respect it resembles the species of the section *Chloropus*, but from the latter it is easily distinguishable by the position of the nodules, which are partly situated along the midrib, and also in the repand-denticulate calyx, for in the section *Chloropus* the nodules are all scattered, and the calyx is either crenate or lobate. Acaridomatia are also found in the section *Aethiopinymphe* and in *Arabanthus*, in some of the species belonging to the section *Crinita*, in two species of *Pavettaster*, and in part of the species belonging to the subgenus *Baconia*, but these species differ in their other characters so strongly from this one that they may be left out of consideration.

207a. **Pavetta usambarica** *Brem.*, sp. nov., *Frutex* usque ad 6 m. altus, glaber. *Rami novelli* siccitate interdum nigrescentes, mox cortice griseo-brunneo nitidulo vestiti. *Folia* in petiolum 0·7–1·0 cm. longum contracta ; lamina lanceolata, 4–8 cm. longa et 1·5–2·5 cm. lata, apice acuta et mucronata, basi acuta, supra nitidula, siccitate supra saturate olivacea vel subnigra, subtus olivacea, domatiifera, nodulis omnibus ad costam adjicientibus linearibus, nervis utroque latere costae 4–6, vix conspicuis. *Stipulae* triangulares, longius apiculatae, intus sericeo-villosae. *Rami floriferi* graciles, toti vel minime parte basali cortice griseo-brunneo vestiti, circiter 4 cm. longi, ex uno vel duobus internodiis compositi, apice jugo singulo foliorum coronati. *Inflorescentia* pedunculo circiter 0·5 cm. longo instructa, laxa, e floribus circiter 20 composita, siccitate nigrescens. *Pedicelli* circiter 4 mm. longi, ramulis inflorescentiae subaequilongi. *Calyx* repando-denticulatus, tubo 1·0 mm.

alto, dentibus 0·5 mm. longis. *Corolla* extra glabra, tubo 11 mm. longo et 1·5 mm. diametro, intus sparse piloso, lobis 8 mm. longis, mucronatis. *Stylus* 2·8 cm. longus.

Habitat Tanganyikam.

Tanganyika. Tanga Province, Lushoto District, Western Usambaras, Shagayu peak area, 2200 m., 24 May 1953, *Drummond & Hemsley* 2735 (K, holotypus) :—shrub layer of low-growing *Podocarpus, Myrica, Adinandra* forest ; shrub 6 m. high with long thin trunk and sparse branching at top ; calyx green ; corolla-tube pale green, lobes white with green tips on under surface ; anthers cream ; ripe fruits black. Ibidem, alt. 2100 m., *Procter* 176.

The next two species belong to section 15. *Dolichosiphon.*

223b. **Pavetta aethiopica** *Brem.*, sp. nov., sectionis *Dolichosiphonis* seriei *Dentatarum*, ovario calyceque glabris et foliis ellipticis cum *P. dolichosiphoni* Brem., *P. eritreënsi* Brem., *P. cinerascenti* Chiov., *P. erlangeri* Brem. et *P. abyssinica* Fresen. congruens, inflorescentiae ramulis pedicellisque dense pubescentibus ad *P. dolichosiphonem*, *P. eritreënsem* et *P. cinerascentem* accedens sed brevitate inflorescentiae ramulorum pedicellorumque ab eis diversa et cum *P. erlangeri* et *P. abyssinica* congruens.

Frutex usque ad 3 m. altus. *Rami novelli* tomentosi, mox glabrescentes tamen et cortice primum brunneo deinde cinerascente vestiti. *Folia* petiolo 0·3–0·5 cm. longo instructa ; lamina elliptica, 4·5–9·0 cm. longa et 3·0–5·0 cm. lata, apice subacuminata, basi acuta vel subcontracta, tenuis, siccitate statu juvenili nigrescens, matura supra olivacea et subtus griseo-viridis, supra nitidula et subtus opaca, supra costa basin versus pubescente excepta glabra, subtus costa nervisque densius et inter nervos sparse pubescens, nodulis plurimis sparsa, costa nervisque supra impressis et subtus prominentibus, nervis utroque latere costae 8–12. *Stipulae* in vaginam 5–8 mm. altam utroque latere apiculatam connatae, extra dense hirsutae. *Rami floriferi* plerumque ex internodiis pluribus compositi, apice jugis duobus foliorum aliis dimidio breviorum coronati, subglabri, ad nodos tamen pubescentes. *Inflorescentia* contracta, ramulis pedicellisque griseo-tomentellis, bracteis scariosis glabris ; pedicelli circiter 3 mm. longi. *Ovarium* glabrum. *Calyx* glaber, tubo 1·3 mm. alto, dentibus 5 mm. longis et basi 1 mm. latis. *Corolla* lactea, extra glabra, tubo 14 mm. longo et 1·3 mm. diametro, intus densius piloso, lobis 8 mm. longis et 2·5 mm. latis. *Stylus* 2·5 cm. longus.

Habitat Aethiopiam.

Ethiopia. Mega Mountain, 1950 m., 7 Sept. 1953, *Bally* 9397 (K, holotypus) :—shrub in juniper forest, up to 3 m. high ; flowers cream ; prefers shady places.

Pavetta aethiopica Brem., *P. dolichosiphon* Brem., *P. eritreënsis* Brem. and *P. cinerascens* Chiov. resemble each other in the elliptic leaves and in the rather striking contrast between the densely pubescent branchlets of the inflorescence and pedicels and the sparsely pubescent, puberulous or glabrous ovary and calyx, but *P. aethiopica* differs conspicuously from the three other species in the shortness of the branchlets of the inflorescence and of the pedicels ; its inflorescence is contracted instead of laxly corymbose. In this respect *P. aethiopica* resembles *P. erlangeri* Brem. and *P. abyssinica* Fresen., two species that also have elliptic leaves, but whose inflorescences are entirely glabrous or only sparsely pubescent ; from *P. abyssinica* the new species differs, moreover, in the greater length of the calyx-lobes, and from *P. erlangeri* in the much shorter corolla and style.

239a. **Pavetta iringensis** *Brem.*, sp. nov., sectionis *Dolichosiphonis* seriei *Denticulatarum*, a specie altera, *P. kyimbilensi* Brem., foliis late oblanceolatis siccitate olivaceis, inflorescentia subglabra et e numero minore florum composita, corollae lobis longioribus distinguenda.

Frutex inflorescentia excepta siccitate haud nigrescens. *Rami* sympodiales, partibus discretis ex internodio longiore et pluribus internodiis brevioribus compositis, novelli puberulo-pubescentes sed mox glabrescentes et cortice griseo-brunneo opaco vestiti. *Folia* in petiolum 0·5–1·0 cm. longum, bifarium ciliatum contracta ; lamina late oblanceolata, 6·5–13 cm. longa et 2·6–4·1 cm. lata, apice acuminata, basi sensim contracta, tenuis, supra glabra, subtus costa sparse et nervis sparsissime ciliata, margine subglabra, costa subtus prominente, nervis utroque latere costae 4–6 supra immersis et subtus prominulis, albidis. *Stipulae* circiter 7 mm. longae, extra pubescentes. *Rami floriferi* 5–7 cm. longi, apice jugo singulo foliorum coronati. *Inflorescentia* contracta, e floribus 20–30 composita, ramulis pedicellisque puberulis ; ramuli usque ad 4 mm., pedicelli usque ad 6 mm. longi. *Ovarium* glabrum. *Calyx* glaber, infundibuliformis, 1·6 mm. altus, vix conspicue denticulatus. *Corolla* extra glabra, matura nondum visa ; lobi 9 mm. longi.

Habitat Tanganyikam.

Tanganyika. Southern Highlands Province, Iringa District, Idete, 1800 m., Nov. 1953, *Carmichael* 290 (U, holotypus, K, isotypus) :—bark greyish-brown with longitudinal striations ; leaves dark green ; fruits round, green, turning black when ripe.

Pavetta iringensis Brem. is doubtless a very near ally of *P. kyimbilensis* Brem., from which, however, it is in the herbarium at once distinguishable by the absence of the black discoloration of the vegetative parts. Other differences are found in the shape and size of the leaves and in the smaller number of flowers per inflorescence.

The remaining three species belong to section 16. *Crinita*.

249a. **Pavetta kisarawensis** *Brem.*, sp. nov., sectionis *Crinitae* seriei *Glabrescentium*, foliis anguste lanceolatis, nodulis fere omnibus ad costam adjicientibus ad *P. bequaertii* De Wild. accedens sed ramis novellis glabris, foliis numero paulo majore nervorum percursis, calycis lobis paulo longioribus, corolla et stylo brevioribus ab ea diversa.

Frutex. *Rami* sympodiales, partibus discretis ex internodio longiore et internodiis aliquibus brevioribus compositis, novelli glabri, mox cortice griseo-brunneo subopaco vestiti. *Folia* sensim in petiolum usque ad 0·9 cm. longum contracta ; lamina anguste lanceolata, 6–13 cm. longa et 1·8–3·8 cm. lata, apice acuta vel subacuminata, basi cuneata, utrinque glabra, siccitate brunnescens, nodulis fere omnibus ad costam adjicientibus linearibus, nervis utroque latere costae 5–9. *Stipulae* triangulares, in aristam usque ad 2 mm. longam exeuntes, extra glabrae. *Rami floriferi* ad apicem duobus vel tribus jugis foliorum coronati et haud raro ex axillis foliorum ramos floriferos novos emittentes, plerumque circ. 8 cm. longi. *Inflorescentia* basi stipulis magnis involucrata, subcapitata, e floribus circiter 30 composita. *Calycis lobi* 5·0–5·5 mm. longi et basi 0·5 mm. lati, glabri. *Corolla* extra glabra, tubo 18 mm. longo, intus subglabro, lobis 5 mm. longis, mucronatis. *Stylus* 3·5 cm. longus.

Habitat Tanganyikam.

Tanganyika. Eastern Province, Kisarawe District, Vikindu Forest Reserve, Sept. 1942, *Paulo* 142 (U, holotypus, K, isotypus*).

Pavetta kisarawensis Brem. is on account of the glabrous ovary and calyx included in the series *Glabrescentes*. In this group of species it comes nearest to *P. bequaertii* De Wild., which it resembles in the narrow leaves with their comparatively small number of nerves. It shows, however, an even more striking resemblance to *P. stenosepala* K. Schum., *P. mangallana* K. Schum. et K. Krause and *P. lutambensis* Mildbr. ex Brem., three species in which the ovary and calyx are pubescent to villous, and which for this reason found a place in the series *Pubescentes*. The discovery of *P. kisarawensis* shows that these two series must be regarded as artificial ones. However, so long as no really natural classification of the species belonging to the section *Crinita* has been worked out, it seems allowable to retain these series.

P. kisarawensis agrees with *P. stenophylla*, *P. mangallana* and *P. lutambensis* also in the presence of secondary flowering shoots springing from the axils of the leaves of the primary one.

250a. **Pavetta kimbozensis** *Brem.*, sp. nov., sectionis *Crinitae* seriei *Glabrescentium*, foliis petiolatis et oblanceolatis vel anguste obovatis, apice acuminatis, nodulis haud conspicue elongatis instructis ad *P. angolensem* Hiern accedens sed foliis omnino glabris, numero minore nervorum percursis, calycis lobis longioribus ab ea recedens.

Frutex. *Rami* sympodiales, novelli glabri. *Folia* in petiolum glabrum usque ad 1·3 cm. longum contracta ; lamina oblanceolata vel anguste obovata, 6·5–14·5 cm. longa et 2·7–4·8 cm. lata, apice acuminata, basi cuneata, utrinque glabra, siccitate supra saturate et subtus dilute brunnea, utrinque opaca, nodulis fere omnibus ad costam adjicientibus, paulum elongatis, nervis utroque latere costae 6–8. *Stipulae* ovato-triangulares, cuspidatae, extra glabrae. *Rami floriferi* graciles, cortice tenui vestiti, ad apicem jugis tribus foliorum coronati, jugo infimo tamen interdum ab aliis paulo remoto, 6–12 cm. longi. *Inflorescentia* basi stipulis magnis involucrata, subumbellata, glabra. *Calycis lobi* anguste triangulares, 12 mm. longi et basi 1·0 mm. lati, glabri. *Corolla* extra glabra, tubo 22 mm. longo, intus glabro, lobis 9 mm. longis. *Stylus* 5·3 cm. longus.

Habitat Tanganyikam.

Tanganyika. Eastern Province, Morogoro District, Kimboza Forest Reserve, Nov. 1953, *Semsei* 1398 (U, holotypus, K, isotypus*) :—very common shrub ; flowers white. Same locality, July 1952, *Semsei* 761 (K) :—shrub up to 4·5 m. high ; flowers white ; fairly common in swamp forest. Same locality and date, *Semsei* 809 (K) :—undergrowth shrub of temperate rain-forest.

Pavetta kimbozensis Brem. shows a very strong resemblance to *P. angolensis* Hiern. It differs from the latter in the slightly smaller size of the leaves with their 6–8 instead of 9–11 nerves on each side of the midrib, the slightly longer calyx-lobes and the somewhat shorter corolla. *P. angolensis* is so far known from Angola only.

272a. **Pavetta cephalotes** *Brem.*, sp. nov., subgeneris *Pavettae* (*Eu-pavettae*), sectionis *Crinitae*, series *Latisepalarum*, calycis lobis linearibus ad *P. sennii* Chiov. accedens sed foliis subtus costa nervisque tomentosis,

* The isotype at Kew has not been examined by the author.

numero majore nervorum instructis, ramis floriferis longioribus, floribus numerosioribus et majoribus ab ea distincta.

Frutex circiter 1·2 m. altus. *Rami* tomentosi, mox cortice griseo opaco vestiti. *Folia* petiolo tomentello 0·6–1·0 cm. longo instructa ; lamina oblonga, 4·5–5·5 cm. longa et 2·4–2·8 cm. lata, acuta vel subacuminata et mucronata, basi acuta sed ad petiolum subito contracta, siccitate olivacea, supra sparse puberulo-pubescens, subtus costa nervisque tomentosa, venulis aliquibus sparse pubescens, inter venulos subglabra, nervis utroque latere costae 8–10, domatiis nullis. *Stipulae* late triangulares, extra dense pubescentes, intus ad basin sericeo-villosae. *Ramuli floriferi* ex internodio 5–7 cm. longo et internodio secundo brevissimo constantes, apice jugo singulo foliorum stipulis magnis connectorum coronati. *Inflorescentia* valde contracta, e floribus circiter 60 composita ; ramuli vix conspicui ; pedicelli 2–2·5 mm. longi, dense pubescentes. *Ovarium* dense pubescens. *Calyx* tubo urceolari 0·5 mm. alto, lobis linearibus 6–7·5 mm. longis et 1·2–1·5 mm. latis, acutis, extra intusque pubescentibus. *Corolla* extra pubescens, tubo 17 mm. longo et 0·8 mm. diametro, fauce usque ad 1·5 mm. diametro dilatato, intus sparse piloso, lobis 5·5 mm. longis et 1·5 mm. latis, mucronulatis. *Stylus* 34 mm. longus.

Tanganyika. Central Province, Mpwapwa, *van Rensberg* 596 (K, holotypus) :— shrub about 1·2 m. high, in deciduous thicket vegetation along gulley-banks.

The calyx-lobes of this species are rather narrow for this series ; they are even narrower than those of *P. sennii* Chiov., but distinctly wider than those of *P. klotzschiana* K. Schum. and the latter's nearest allies, which I referred to the series *Pubescentes*. In other respects too it resembles these species, and this evidently means that the distinction between the series *Latisepalae* and the series *Pubescentes* is to be regarded as artificial. However, so long as no better division can be provided, the present one may be kept up, as it is after all rather convenient.

282b. **Pavetta handenina** *Brem.*, sp. nov., sectionis *Crinitae* series *Transvaalensium*, maxime ut *P. lindina* Brem. sed foliis basi acutis, numero majore nervorum percursis, inflorescentia e floribus pluribus composita, corollae tubo brevi extra glabro, lobis contra ad costam hirtellis ab ea facile distinguenda, corollae tubo calycis lobis subaequilongo cum *P. hirtiflora* Brem. congruens sed foliis angustioribus, numero majore nervorum percursis, indumento densiore, corollae tubo extus glabro ab ea recedens.

Fruticulus circiter 1 m. altus, ramis gracilibus, novellis griseo-tomentellis, vetustioribus cortice albicante obtectis. *Folia* petiolo tomentello 5–10 mm. longo instructa ; lamina oblanceolata vel oblonga, 3–8 cm. longa et 1·5–3·5 cm. lata, apice subacuminata et mucronata, basi acuta, tenuis, siccitate supra olivacea, supra primum dense, deinde sparse pubescens, subtus in costa nervisque prominulis albo-tomentella, inter nervos primum dense, deinde sparse pubescens, nervis utroque latere costae 8–11. *Stipulae* ovato-triangulares, subaristatae, extra tomentosae, intus in axilla pilis longis sericeae, ceterum glabrae. *Rami floriferi* 9–13 cm. longi, ex internodiis tribus longitudine gradatim decrescentibus et internodio apicali brevissimo compositi, foliis superioribus solis persistentibus. *Inflorescentia* e floribus circiter 30 composita, ramulis pedicellisque

griseo-tomentellis ; ramuli et pedicelli 2–3 mm. longi. *Ovarium* griseo-tomentellum. *Calyx* fere ad basin partitus, lobis subulatis 6–7 mm. longis et 0·7 mm. latis griseo-pubescentibus. *Corolla* alba, tubo extra glabro 10 mm. longo et 0·7 mm. diametro, lobis 5 mm. longis et 1·8 mm. latis, extra ad costam hirtellis, breviter apiculatis. *Stylus* 1·7 cm. longus.

Habitat Tanganyikam.

TANGANYIKA. Handeni District, 20 km. from Handeni on Mziha road, 600 m., 9 Mar. 1953, *Drummond & Hemsley* 1460 (K, holotypus) :—in *Brachystegia* woodland ; small shrub 1 m. high ; corolla white ; stigma green ; anthers buff, turning blackish.

Pavetta handenina Brem. is doubtless a near ally of *P. lindina* Brem., with which it agrees in the nature of the indumentum, in the distinctly petiolate leaves and in the rather long calyx-lobes, but from which it differs in the slightly larger size of the leaves with their greater number of nerves, in the more numerous flowers, the shorter corolla-tube, glabrous outside, and the shorter style. Distinctly petiolate leaves are found also in *P. hirtiflora* Brem., which agrees with *P. handenina* in the rather long calyx-lobes and the short corolla-tube, but in *P. hirtiflora* the corolla-tube is hirtellous outside, and its leaves are elliptic.

Little Beasts.*—At first thought the botanist is unlikely to feel much concern about the Gall-midges or Cecidomyidae a group of insects whose fragile form and small size convey no suggestion of importance. His interest, and his indignation, may be aroused when he learns how plants suffer from their attacks, and, should his work involve the growing of plants in experimental plots, he may well come to be on bad terms with these pests. Vegetables and cereals, fruits and ornamentals, all may suffer damage, sometimes severe, from larvae of different species of this group. During a widespread attack on wheat in the Irish Republic in 1952, it was estimated that 75% of the grain was destroyed in some fields, and that the larval population approximated to 319 million per acre.

From his study of the gall-midges extending over 30 years, Dr. H. F. Barnes is recognised as the authority on this group. In a work of eight volumes he has written a comprehensive account of all known species of economic importance. Here, in volume 7, he deals with the midges to which the cereal crops throughout the world are hosts. For each cereal in turn he lists the gall-midges recorded on it, their incidence and destructiveness, their life-history, and possible means of combatting them. The book is packed with information and every page gives clear evidence of the author's amazingly intimate knowledge of these insects as they occur not only in this land but in many different countries. To anyone likely to meet the gall-midges of cereals this book would seem indispensable.

T. A. RUSSELL.

* Gall Midges of Economic Importance. Vol. 7 : Gall Midges of Cereal Crops. by H. F. Barnes, M.A., Ph.D. London : Crosby, Lockwood & Son Ltd., 1956, pp. 261, illus. Price 21/-.

AN EARLY SPECIMEN OF ULMUS CARPINIFOLIA GLEDITSCH.

R. Melville

Comparatively few herbarium specimens of elms have come down to us from the 18th century. There are several in the Linnean Herbarium, some of Miller's types are in the herbarium of the British Museum, but others have not survived, among them that of *U. glabra* Miller, which is regarded as a synonym of *U. carpinifolia* Gleditsch. No type specimens are known for either *U. foliacea* Gilibert or *U. nitens* Moench (Melville, Journ. Linn. Soc., Bot., **53,** 83, 1946), both synonyms of the Gleditsch species. Until recently no specimen of *U. carpinifolia* authenticated by Gleditsch was known, but Dr. F. G. Meyer has drawn my attention to the existence of one in the Bernhardi Herbarium at the Missouri Botanic Garden. By courtesy of Dr. R. E. Woodson, I have been able to borrow the specimen and examine it in detail.

It is necessary to consider whether the Bernhardi specimen should be regarded as the type of *U. carpinifolia* Gleditsch, especially as a neotype had been proposed before this specimen came to my notice (Melville, loc. cit., 85). The authenticity of the specimen is attested by the wording of the label which is as follows :

Ulmus carpinifolius Gled.
nondum a Linneo descriptus, quam-
vis foliorum habitu ac florescent-
tia a campestri adeo differat.
ex vivario Berol.
Deest mihi floribus, altera vici mittendis.

The specimen itself consists of a single adult short-shoot and a juvenile shoot. The short-shoot has three leaves, one of which is detached, and represents a rather small and broad leaved form of Gleditsch's species. The juvenile shoot could be either a sucker shoot or a juvenile type of epicormic shoot. It has three leaves remaining, all of them detached from the stem. The leaf characters are not inconsistent with a juvenile shoot from a relatively broad-leaved adult, although rather narrow in shape, but they could equally well represent a sucker shoot from a stock on which the other had been grafted. This is not at all unlikely, since the tree was in a botanic garden. The shape of the subdistal leaf of the adult shoot approximates very closely to a theoretical shape illustrated in an earlier paper (Melville, loc. cit., 88, text fig. 4, 150). This is $1\frac{1}{2}$ times as broad, for its length, as corresponding leaves of *U. carpinifolia* Gleditsch var. *glandulosa* (Lindl.) Melville, which has about the normal leaf shape for English representatives of the species. The Bernhardi specimen lies among the broadest variants of the species, which would not suggest a *Carpinus* leaf.

The description of *U. carpinifolia* was published by Gleditsch in his Pflanzenverzeichniss (354-5, 1773). No copy of this rare work was available in London, and I am indebted to Dr. R. C. Rollins of the Gray Herbarium for the transcript of the original text, which is reproduced below.

Ulmus carpinifolia, floribus fasciculatis pendulis majoribus.
Ulmus folio lato scabro, cortice cinereo glabro.
Die Saynbuchenrüster.
Die Baurüster. Iper, Wiede.

Hat schmale glatte Blätter, und kurze, runde kleine Blumenbüschel, wie die dritte Art, treibet einen schönen Stamm, mit mehr aufrecht wachsenden Zweigen, und ist unter allen am Holze die beste.

Bei den Rüstern, ist wie bei den Weiden und Rosen, noch eine grosse Ingewissheit und Undeutlichkeit in der Beschreibung und Benennung. Man hat hier die sechs angeführten Arten, und die erste, zweite, fünfte und sechste, kommen in etlichen Provinzen wild zum Vorschein. Diejenigen sind nur im Stande, die wahren Unterschiede zu bestimmen, welche viele Jahre Rüstern gesäet, die von ausfallenden Saamen aufgehenden ausgepflanzet, andere Rüstern von den fremden, mit den vorbesagten abgeleget, und auf ihre grosse Veränderung in verschiedenen Boden Acht gehabt haben."

There is some inconsistency between the latin and the German texts. The phrase, " Ulmus folio lato scabro ", does not suggest a *Carpinus* like leaf, which is more consistent with the German description of 'narrow, smooth leaves'. In relation to the leaf shape, therefore, more emphasis should be placed on the German text. It is evident that the Bernhardi specimen does not fit in with this interpretation and the observation at the bottom of the label to the effect that he (Gleditsch) had not seen the flowers and that they should be sent to him later, makes it plain that this particular specimen was not in his hands when he wrote the description. It was, doubtless, a specimen received by him later for his opinion. All these circumstances show that the Bernhardi specimen cannot be regarded as a syntype, although, had it been available, it could have been considered as a possible neotype when the neotype was chosen.

The choice of the neotype was influenced by the statement by Rehder (Journ. Arn. Arb., **19,** 266, 1938) that *U. carpinifolia* was " based on ' *Ulmus carpini folio seu cortice arboris albido* ' of Ruppius Fl. Jen. ed. Haller. 330 (1745), as is clearly shown by the citation under *U. carpini folio* in Gleditsch, Syst. Einleit. Forstwiss. **1,** 240 (1775) where Ruppius is cited." The complete entry on p. 240 of the Systematische Einleitung is as follows :

" 5. Ulmus carpini folio, seu cortice arboris albido. Rupp. Flor. Jen. ed. Haller. 330
Ulmus folio lato scabro, cortice cinero glabro : florum fasciculis majoribus pendulis.
Hannbuchenrüster. Baurüster. Wiede. Glatt-blattrige Wiede. Weiserüster."

The same wording is repeated on pp. 278–9, with the addition of several other colloquial names, including the English versions " Hornbeam-Elm, Hornbeam-leaved elm, Smooth-leaved Elm." There is a general discussion of elms on the following pages, which adds nothing of significance to this enquiry. Comparison of this text with the original of the Pflanzenverzeichniss and that of Ruppius does not seem to justify Rehder's categorical statement. The only common component is the epithet *carpinifolia*, which the leaf shape may have suggested to both

botanists. It is at least equally likely that in 1775 Gleditsch was giving credit to an earlier account of what seemed to him to be the same species of elm, which two years earlier he had not seen. Whichever view is correct, it does not invalidate the choice, already made, of a neotype from the area of the Flora Jenensis.

GARDENING BOOKS.

The following books have recently been published by W. H. and L. Collingridge Limited :—

(1) **The Unheated Greenhouse.***—This book on the maintenance of the unheated greenhouse shows how such a house can provide a wealth of colour throughout the year. Over 200 genera suitable for the purpose are dealt with and these include herbaceous plants, flowering shrubs and trees and bulbs. The author, who has considerable knowledge of the subject, gives useful information on watering, ventilation, soils and manures, pests and diseases together with a list of the plants that may be grown in the unheated greenhouse. The book is well illustrated and concludes with a useful index.

(2) **The Gladiolus.***—The author of this interesting book has grown gladioli for many years and here he describes in a pleasant style the cultivation of this beautiful flower in all its aspects ; there are chapters on its history, exhibiting, harvesting, propagating, marketing, diseases and pests.

Descriptive lists of recommended varieties are included, while the book is illustrated with one coloured and many black and white photographic illustrations and provided with a useful index.

(3) **Cloche Cultivation.***—Specially written for the amateur gardener this little book will be useful to all those who are interested in the cultivation of crops under cloches. The author shows how cloches can be used to improve crops and protect them from bad weather. The book is illustrated with photographs and line drawings.

(4) **Plant Propagation.***—This is a " Picture Book " in the series of " Amateur Gardening " picture books, dealing with the propagation of plants by division, layering, cuttings, grafting and budding, all explained in simple language. The various operations are depicted in stages by over 140 illustrations. The book includes an account of aerial layering with the use of polythene bags.

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(1) The unheated Greenhouse. By Deenagh Goold-Adams. Pp. 176. 38 photographs, 19 line drawings. 18/-. 1955.
(2) The Gladiolus for garden and exhibition. By D. Gourlay Thomas. 30 illus. 15/-. 1955.
(3) Cloche Cultivation. By G. B. Walkden. 22 photographs, 24 line drawings. 9/6d. 1955.
(4) Plant Propagation. " Amateur Gardening " Picture Book Number 4. Edited by A. G. L. Hellyer. Over 140 photographs and drawings. 7/6d. 1955.

(5) **Herbaceous Borders.***—Over a hundred different hardy herbaceous plants are illustrated in this book which is another " Picture Book " in the series mentioned above. The maintenance and construction of borders are explained in a very helpful manner and guidance is given in the choice and preparation of site, planting, staking and tying, division, and winter care.

(6) **Miniature Gardens.***—This book has been written by one who has constructed many miniature gardens and is thus able to write with authority on the subject. The author describes the various containers, pans and sinks, the dwarf plants that can be grown in them, and concludes with a chapter on the Japanese art of dwarfing. The book gives useful information on planning and planting and is illustrated with black and white drawings.

H. S. MARSHALL.

(5) Herbaceous Borders. " Amateur Gardening " Picture Book Number 5. Edited by A. G. L. Hellyer. Over 140 photographs and drawings. 7/6d. 1955.
(6) Miniature Gardens. " Amateur Gardening " Handbook No. 13. By C. F. Walker. 18 illus. 4/-. 1955.

NOTES ON CYPERACEAE : XL.*

E. NELMES

A New Malaysian Carex.

In my revision of Malaysian *Carices* (Reinwardtia, 1 ; 379 : 1951), at the end of the description of species no. 70, is a note saying, " Owing to lack of authentic material of *C. rugata*, I am not certain about the above cited specimens being correctly determined ". Since then specimens of the Japanese *C. rugata* Ohwi have been sent to me by Dr. T. Koyama, a Japanese cyperologist, echoing my doubt about the determination of the Malaysian plant. An examination of the material of *C. rugata* kindly sent by Dr. Koyama shows me that it is specifically distinct from the Malaysian *Carex*, which is accordingly given a new epithet, published below. In correcting the treatment in Reinwardtia it is necessary only to substitute the epithet " *conhorrhyncha* " for " *rugata* ", and delete the synonyms, as the English description and citations, of course, relate to the new Malaysian species and not to the Japanese *C. rugata* Ohwi.

Carex conorrhyncha *Nelmes*, sp. nov. ; affinis *C. montivaga?* S. T. Blake, sed glumis femineis sordide albidis aristatis, utriculis interdum ellipsoideo-lageniformibus brevioribus, achaeniis plus minus obovoideis praecipue differt.—Borneo, *Clemens* 28023 (Kew, holotype ; British Museum, Leiden, isotypes).

*Continued from K.B. 1956 : 111 (1956).

Introducing Plant Taxonomy.*—For a subject with a long history, plant taxonomy has relatively few textbooks. Therefore this introductory work, written especially for students studying local floras and " for the adult amateur botanist " may expect an appreciative welcome. It is planned on similar lines to Prof. Lawrence's " Taxonomy of Vascular Plants " (1951), the selected parts being rearranged and rewritten.

The first three chapters introduce the subject and discuss some systems of classification and the relation of taxonomy to the Theory of Evolution. The fourth and longest chapter deals with plant morphology, defining descriptive terms in organ-groups, which is the best method and, following this, three chapters give, respectively, advice on the collection of plant specimens, an introduction to nomenclature and a brief treatment of the influences of phylogeny, cytology and genetics on taxonomy. Sketches of the lives of about thirty botanists provide a framework for an interesting chapter on the history of taxonomy in North America. The last chapter gives concise notes on forty-two families of flowering plants (ferns and gymnosperms being dealt with in Chap. IV), of which all but two are represented in the British flora and although some of the paragraphs are very short they do, together with the excellent figures, often provide useful diagnoses. Condensation here has, however, led to some very misleading statements ; the qualification " usually " should have been included more often. Particularly for the more specialised families are the diagnoses inaccurate. Those for Gramineae and Asclepiadaceae would astonish experts on these groups ; that for the Grasses strangely contradicts in some particulars the author's admirable account of the family in his " Taxonomy of Vascular Plants ". The index includes a glossary in the form of references to the main text. The drawings by Mrs. Sheenan [neé Ruff] are very good, thirty-seven of the sixty-nine being new ; a particularly fine pair illustrates types of ovary on pages 72 and 73.

In such an avowedly introductory textbook one expects a high standard of accuracy so that the beginner may be neither confused nor, worse, led astray by it. It is most regrettable that in this book the inaccuracies, whether misprints or errors, are so frequent. A serious example occurs on p. 71 in the text and in the footnote and again on p.73 : the terms " abaxial " and " adaxial " are confused and as defined here contradict the definitions in the author's " Taxonomy of Vascular Plants ". Will not the uninitiated student imagine that in Fig. 34, " c, . . . , gynoecium syncarpous " is somehow different from " d, ... , ovary compound " because different phrases are used, the more so since " apocarpous " is wrongly equated with " compound " in the text on the same page ? In Fig. 23 we find the term " bullate " illustrated by a leaf puckered far too strongly, while the figure incorrectly illustrating " rugose " in the same place would be described as " bullate " by most phytographers. British readers, as they should expect, will meet some unfamiliar terms and usages, for example : " silicle for " silicula " (omitted with " siliqua ", from the key to fruits, p. 79) ; " decompound " for " bipinnate " ; " convolute " for " contorted " ; " truncate " being applied only to leaf bases (not apices) ; " tomentose " defined as being

* An Introduction to Plant Taxonomy, by George H. M. Lawrence. Pp. vii and 179 ; 69 figs. New York to London : The Macmillan Co. 1955. 23/-.

appressed and " utricle " as a fruit type (can this be correct, even in America ?).

The section dealing with the difficult subject of inflorescences and that on the structure of ovaries are both presented from a phylogenetic point of view, which method is scarcely suitable for an elementary textbook. Actual structures are not distinguished from hypothetical forms and, generally in Chap. 4, interpretation obtrudes upon description. The section on " staminodes " on p. 68 exemplifies this (their position not being used in their definition) as does the paragraph on p. 74 which begins " In the ovary of some kinds of flowers that *once had* axile placentation, there has occurred a loss of the partitions . . . . . " (my italics). An error in the chapter on nomenclature must be mentioned ; the advice on p. 93 to contract names like *Quercus hemisphaerica* Bartram ex Willdenow to *Q. hemisphaerica* Bartram is incorrect, it is " Bartram ex " which may be omitted. The name " Lotoideae " on page 134 for a subfamily of Leguminosae will be unfamiliar to most readers ; it would have been better to use either Papilionoideae or Faboideae as is required by the International Code of Botanical Nomenclature (1952).

The number of inaccuracies found in this work justify the conclusion that it is unsuitable as an elementary reference book in this country, even apart from the unfortunate phylogenetic bias and the excusable American viewpoint. The format and presentation are attractive but it is possible that the relatively high price will deter students from obtaining it.

JOHN LEWIS

Outdoor Salad Crops.*—A new edition of this practical booklet has been revised by the Vegetable Group of the National Agricultural Advisory Service. It deals with those crops which are grown principally in the open, assisted as necessary by the use of glass to provide plants early in the season. The crops considered are : lettuce, endive, chicory, radish, celery, salad or spring onions, corn salad, ridge cucumbers, tomatoes, carrots, beetroot, and celeriac. In addition to cultural details, pests and diseases are discussed for some of the crops.

* Outdoor Salad Crops, Ministry of Agriculture, Fisheries and Food, Bulletin No. 55, ed. 6 (1955). 2/6d.